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A 4-volume analysis of the socioeconomic impact assessment process for western energy resource developments. Vol. I provides a general analysis of the state-of-the-art, explores the implications of uncertainty and risk for both preparers and users of impact assessments, and recommends performance/evaluation standards for future assessments. Vol. II details assessment needs and alternative approaches and describes step-by-step a demonstration methodology. Vol. III describes the application of the demonstration methodology in two case studies: northwest Colorado and southeast Utah. Vol. IV documents the computer program which incorporates the demonstration methodology.

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SOCIOECONOMIC IMPACTS OF WESTERN ENERGY RESOURCE DEVELOPMENT

VOLUME III: CASE STUDIES

DENVER RESEARCH INSTITUTE
UNIVERSITY OF DENVER

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SOCIOECONOMIC IMPACTS OF WESTERN ENERGY RESOURCE DEVELOPMENT

VOLUME III: CASE STUDIES

For

Council on Environmental Quality, Executive Office of the President
Resource and Land Investigations Program, U.S. Geologic Survey
U.S. Department of Energy
Environmental Protection Agency
National Science Foundation

By

Denver Research Institute

and

Resource Planning Associates

June 1979

PREFACE

This is one of a series of four volumes analyzing the socioeconomic impact assessment process for western energy resource developments. The volumes deal primarily with a set of impacts which typically occur when large-scale resource developments are superimposed on sparsely populated, isolated local environments. The volumes are one result of a multi-year research project, sponsored by several federal agencies.

During this project, the existing state-of-the-art for impact assessment in rapid growth situations has improved considerably. The thinking of the federal agencies has evolved, and the objectives of this research effort have been modified several times. They describe and evaluate the state-of-the-art in assessing these recurring impacts. They also provide examples of other types of impacts which may occur under certain circumstances and suggest means for identifying and analyzing them.

Sudden changes and high levels of risk and uncertainty are inherent characteristics of most western energy developments. The magnitude, timing, and duration of the energy developments themselves are often uncertain. In spite of recent improvements, the current state-of-the-art in impact assessment remains limited in its ability to take into account the effects of major discontinuities in economic activities, population growth and social environments. It is also limited in its ability to take into account the effects of one component of change on other components, for example, the effect of housing conditions on individual stress levels and population migration rates.

These difficulties in forecasting, whether due to the energy development decisions themselves or to the limitations of forecasting techniques, do more than just cause problems for the impacts analyst. They are themselves contributors to adverse impacts. Excessive risk is a major cause of breakdowns in both public and private capital markets. Inadequate early warning limits the capacity for physical, economic and social institutional planning.

Volume I in this series provides a general analysis of the state-of-the-art, explores the implications of uncertainty and risk for both preparers and users of impact assessments, and recommends performance/evaluation standards for future assessments.

Volumes II, III, and IV are addressed to practitioners in the impact assessment field. Volume II provides detailed analyses of assessment needs and alternative approaches for each component of a typical assessment process. It also provides a step-by-step description of a demonstration methodology for each component. This demonstration methodology has been designed particularly for use by state-level impact assessment teams and for facilitating extensive sensitivity testing to explore the implications of uncertainty.

Volume III describes the application of the demonstration methodology in two case study areas: northwest Colorado and southeastern Utah. The Colorado case study examines the magnitude of uncertainty due to three general factors: (1) difficulty in forecasting the magnitude, timing, and duration of development (particularly in an embryonic synfuels industry); (2) difficulty in forecasting the geographic distribution of impacts; and (3) difficulties in quantifying individual components of impacts (e.g., public expenditure increases). The Utah case study explores the importance of local primary data to the analysis. Analyses were first completed using only secondary data; they were then repeated using primary data, and the results compared.

Volume IV documents the computer program which incorporates the demonstration methodology.

This research project was carried out by the Denver Research Institute and Resource Planning Associates. It was jointly sponsored by the President's Council on Environmental Quality, the Department of the Interior, Geological Survey, the Environmental Protection Agency, the Department of Energy, and the National Science Foundation. The project included substantial inputs from representatives of the sponsoring agencies. Project participants and sponsor representatives are listed below.

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INTRODUCTION

This volume describes applications of the demonstration methodology described in Volume II and graphically depicted in Exhibit 1. It presents two case study areas: one in northwest Colorado and the other in southeastern Utah.

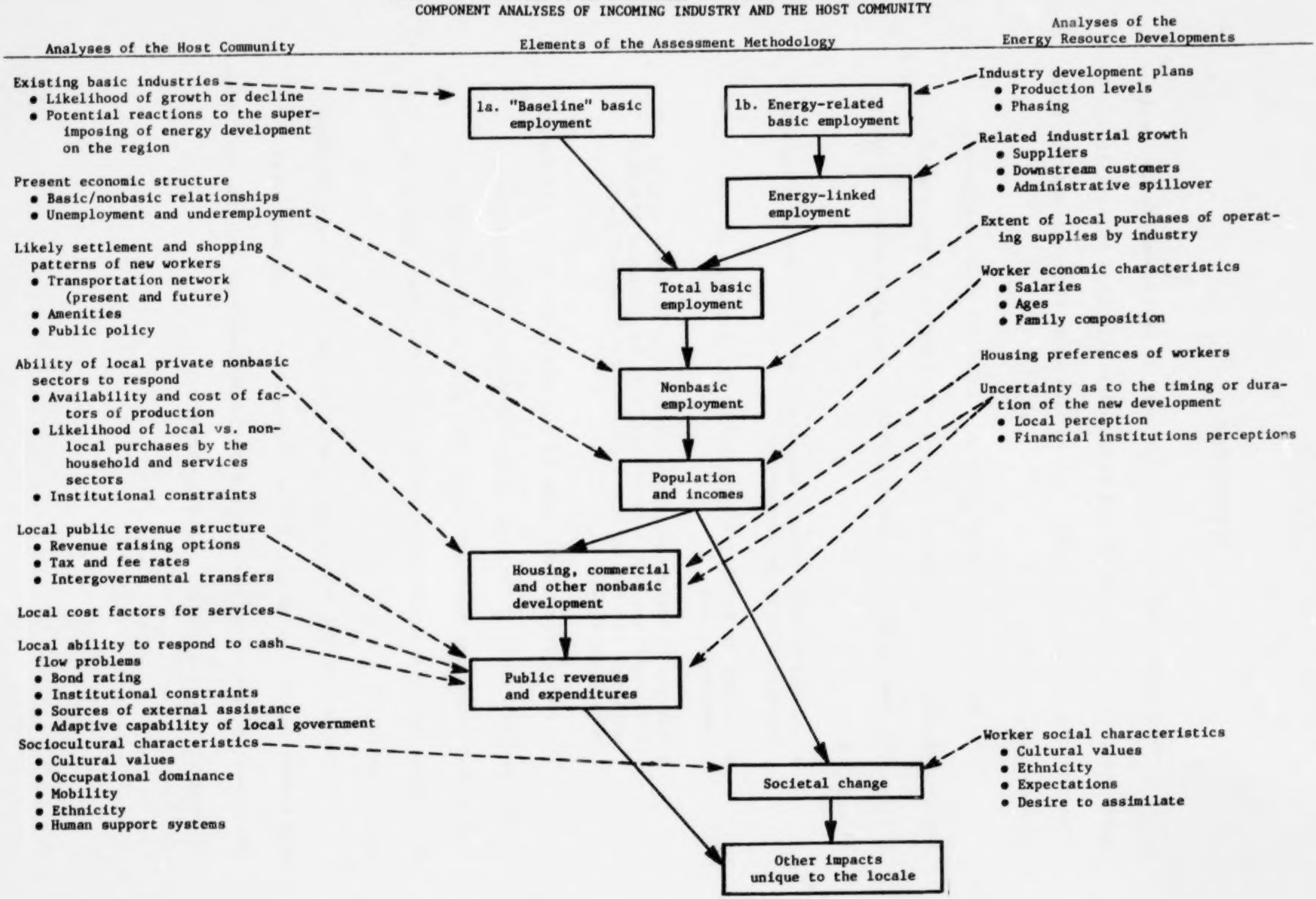
The northwest Colorado area is a case where uncertainty concerning proposed developments and their impacts is particularly great. The case study includes sensitivity analyses examining the effects of:

- changes in the timing, magnitude and duration of proposed energy-related developments;
- changes in predicted geographic distribution of new residents; and
- changes in other economic forecasting factors, e.g., the magnitude and rate of build-up in nonbasic economic activity and the methodology used to forecast local public expenditures.

The southeastern Utah area is one which was less well-known to the project staff. The case study was performed twice, once using only secondary data and interviews with state and federal officials, and then again utilizing local primary data and local interviews.

The policy and methodology implications of the case studies are summarized in Volume I. The sections which follow emphasize the detailed procedures used to apply the methodology and the differences in results associated with changing inputs.

EXHIBIT 1. OVERVIEW OF AN INTEGRATED ASSESSMENT METHODOLOGY, INCLUDING COMPONENT ANALYSES OF INCOMING INDUSTRY AND THE HOST COMMUNITY


Analyses of the Host Community
Elements of the Assessment Methodology
Analyses of the Energy Resource Developments
Existing basic industries
• Likelihood of growth or decline
• Potential reactions to the superimposing of energy development on the region
Present economic structure
• Basic/nonbasic relationships
• Unemployment and underemployment
Likely settlement and shopping patterns of new workers
• Transportation network (present and future)
• Amenities
• Public policy
Ability of local private nonbasic sectors to respond
• Availability and cost of factors of production
• Likelihood of local vs. nonlocal purchases by the household and services sectors
• Institutional constraints
Local public revenue structure
• Revenue raising options
• Tax and fee rates
• Intergovernmental transfers
Local cost factors for services
Local ability to respond to cash flow problems
• Bond rating
• Institutional constraints
• Sources of external assistance
• Adaptive capability of local government
Sociocultural characteristics
• Cultural values
• Occupational dominance
• Mobility
• Ethnicity
• Human support systems
1a. "Baseline" basic employment
1b. Energy-related basic employment
Energy-linked employment
Total basic employment
Nonbasic employment
Population and incomes
Housing, commercial and other nonbasic development
Public revenues and expenditures
Societal change
Other impacts unique to the locale
Industry development plans
• Production levels
• Phasing
Related industrial growth
• Suppliers
• Downstream customers
• Administrative spillover
Extent of local purchases of operating supplies by industry
Worker economic characteristics
• Salaries
• Ages
• Family composition
Housing preferences of workers
Uncertainty as to the timing or duration of the new development
• Local perception
• Financial institutions perceptions
Worker social characteristics
• Cultural values
• Ethnicity
• Expectations
• Desire to assimilate

1. NORTHWEST COLORADO CASE STUDY

A. Description of Energy Development

The general methodology for the development of basic employment scenarios, as described in Volume II, involved several different means of gathering information. In the northwest Colorado case study, a variety of sources were used. These included the Bureau of Land Management's Northwest Colorado Coal Regional Environmental Statement[1] (review drafts) and personal interviews with officials of the coal, oil shale and power plant companies planning operations in the region, other energy-related or linked industries, federal resource management agencies, and local government planning officials. Constant monitoring of local press announcements was necessary to keep abreast of the developments, delays and/or postponements in the regional energy industry. However, press announcements of new developments may often omit the uncertainties and other caveats which should be given consideration in any assessment process.*

Despite the wide range of sources used, complete information was not available on all projects. Rules of thumb were therefore developed to relate employment to capital investment, and output to employment and/or capital investment. These were based on mining operations already in existence and on judgment of industry representatives. The rules of thumb developed are shown in Exhibit A-1.

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*In an October 1, 1978 Denver Post article, a Union Oil Co. of California spokesman said, "Assuming we get that $3 tax credit and all our permits, we'll start (construction) almost immediately--that means next spring." However, no mention was made of the likelihood of these events occuring.[2]

EXHIBIT A-1. EXAMPLE OF RULES OF THUMB RELATING EMPLOYMENT, OUTPUT, AND CAPITAL INVESTMENT

(1977 dollars and costs)

Oil Shale (based on Tract C-b)

- $125,000 per construction person-year capital investment
- $9,000 per barrel per day capacity capital investment (after plant is running)
- $300,000 capital investment per operating employee
- 1,300 bbl per day capacity person-year operating employment

Coal (older mines may have lower future investment increments)

- $35-45 M capital investment per million tpy of capacity for underground mine
- $15-20 M capital investment per million tpy of capacity for surface mine
- 3,000-8,000 tons per person-year operating employment for underground (varies with age of mine, union/nonunion employment conditions)
- 10,000-40,000 tons per person-year operating employment for surface (varies with age of mine, depth of over burden and thickness of coal seams)

Each energy-related development project was summarized separately, giving the following information: temporary and operating employment by year, capital investment for the new or expanded mine or power plant, and a yearly production buildup. Also included were the construction and operating schedules by project under the various scenarios of energy development being considered (e.g., high or low, described further in the following section), the location of the mine and any assumptions made concerning the anticipated employees' place of residence. Exhibits A-2, A-3, A-4 provide example summaries from a coal mine, a power plant and an oil shale facility described as of April 1978.*

Procedure. Two scenarios were formulated in an attempt to address the major factors (both internal and external to the region) which could affect the rate of energy development in northwest Colorado. Scenario I includes all known coal mines, uranium mines, power plants and other related energy developments (e.g., construction of railroad spurs and transmission lines, etc.). Some preliminary oil shale development is allowed to begin, but due to an assumed lack of full technological

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*The companies are not identified on the sample project summary sheets because confidentiality was promised during interviews. Companies considered in the development scenarios were: Anschutz Coal, Colowyo Coal, Consolidation Coal, Dravo Coal, Empire Energy Company, GEX Coal, Mid-Continent Coal, Rienau Coal, Utah International, C-a Oil Shale, C-b Oil Shale, Parahoe Oil Shale, Superior Oil Shale, Utah U-a and U-b Oil Shale, miscellaneous oil shale (Union, Colony, and Naval Oil Shale Reserves), other miscellaneous oil shale (new federal leases and expansion of C-a and C-b), and miscellaneous uranium mines, Colorado-Ute Electric Association, and the D&RGW Railroad.

EXHIBIT A-2. EXAMPLE SUMMARY OF AN UNDERGROUND COAL MINE

Scenario I & II

Location: x miles south
of _______ Mine in Pitkin
County. Residents in
Garfield County (largely
in Carbondale).

	Temporary Employment	Operating Employment	Investment	Production
1977	50	150	\$50 $\overline{M}$	
1978		212		
1979		280		1 $\overline{M}$ tpy
1980		280		
1981		280		
1982		280		
1983		280		
1984		280		
1985		280		
1986		280		
1987		280		
1988		280		
1989		280		
1990		280		

EXHIBIT A-3. EXAMPLE SUMMARY OF A COAL-FIRED POWER PLANT--1070 MW

Scenario I & II

(Sc. I stops changing after 1981; Sc. II is reflected here)

Location: x miles south of (town) in Moffat County. Residents in Moffat County (largely in Craig).

	Temporary Employment	Operating Employment	Investment	Production
	750			
1977	1250	50	$500 M̄	
1978	892	50		
1979	712	100		
1980	212	150		535 MWe
1981	-	152		
1982	700	152	$700 M̄	
1983	1220	152		
1984	1400	157		
1985	1200	157		
1986	1100	170		
1987	200	225		1070 MWe
1988		287		
1989		287		
1990		287		

EXHIBIT A-4. EXAMPLE SUMMARY OF OIL SHALE (MODIFIED IN SITU)

Scenario II

(Sc. I goes to
0 emp. after
1981)

Location: x miles (air
line) southwest of
(town) in Rio Blanco
County. Residents in
Rio Blanco County (half
in Meeker, half in Rifle
through 1981, then 1/4
in Meeker, 3/4 in Rangely).

	Temporary Employment	Operating Employment	Investment	Production
1977		25		
1978	150	25	\$50 $\overline{M}$	
1979	300	125		
1980		275		1.5 $\overline{M}$ bbl/y
1981		275		1.5
1982	300	300	\$600 $\overline{M}$	1.5
1983	550	350		1.5
1984	1025	650		3.0
1985	1550	1150		6
1986	600	1500		13
1987		1720		15
1988		1720		18
1989		1720		22
1990		1720		22

success and absence of federal assistance, all operations are assumed to cease after 1981. Exhibit A-5 details the total new energy-related county employment that was generated in Scenario I.

Scenario II assumes that oil shale will be subsidized by the federal government and will become technologically and economically feasible. Thus, several oil shale facilities are projected to operate throughout the remainder of the study period. In addition, Scenario II includes all the Scenario I developments, plus the establishment of three more coal mines. This scenario also includes linked industry growth in uranium and oil shale regional offices, federal offices and mine service and supply companies in Mesa County.* Total new employment by county for Scenario II is shown in Exhibit A-6.

A third scenario was developed for Sensitivity Analysis 1. As in Scenario II, oil shale is developed, but commercialization begins an average of three years later, stretching the labor force buildup over a longer time-span. Therefore, the full impacts are not felt as early as in the Scenario II case. The power plant and one coal mine are also assumed to be built at a slower rate. Exhibit A-7 illustrates the difference in timing between Scenario II and Sensitivity Analysis 1 of one oil shale facility.

The other sensitivity analyses prepared for the Colorado study area are listed below. Further description of each is found under the

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*The linked industry was calculated by taking 5 percent (uranium and oil shale regional offices--2 percent, federal offices--1 percent, and mining service and supply--2 percent) of the total incremental energy basic employment for each year.

EXHIBIT A-5. NEW BASIC ENERGY-RELATED EMPLOYMENT
SCENARIO I

	Rio Blanco		Mesa		Garfield		Moffat		Other*		Total	
	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating
1977	--	50	20	120	0	0	1390	220	225	610	1635	1000
1978	250	275	--	240	0	0	952	570	--	712	1202	1797
1979	375	225	--	240	0	0	712	805	--	780	1087	2050
1980	--	275	--	240	0	0	212	1169	--	780	212	2464
1981	--	275	--	340	0	0	--	1226	--	780	--	2621
1982	--	--	--	340	0	0	760	1261	--	780	760	2381
1983	--	--	--	340	0	0	1280	1261	--	780	1280	2381
1984	--	--	--	340	0	0	1400	1277	--	780	1400	2397
1985	--	--	--	340	0	0	1200	1277	--	780	1200	2397
1986	--	--	--	340	0	0	1100	1290	--	780	1100	2410
1987	--	--	--	340	0	0	200	1345	--	780	200	2465
1988	--	--	--	340	0	0	--	1407	--	780	--	2527
1989	--	--	--	340	0	0	--	1407	--	780	--	2527
1990	--	--	--	340	0	0	--	1407	--	780	--	2527

*Includes two mines located in Pitkin County and a Utah oil shale facility, both of which will have impacts on the case study area, and the construction of an electric utility's transmission lines which will take place in more than one county.

EXHIBIT A-6. NEW BASIC ENERGY-RELATED EMPLOYMENT SCENARIO II

	Rio Blanco		Mesa		Garfield		Moffat		Other*		Total	
	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating
1977	--	70	20	120	--	80	1390	220	225	610	1635	1030
1978	250	313	--	278	--	80	997	570	--	712	1247	1953
1979	1830	560	--	315	200	200	912	830	--	780	2942	2685
1980	1450	1330	--	383	300	300	212	1349	700	780	2662	3759
1981	1400	1960	--	537	200	400	--	1406	400	980	2000	5283
1982	800	2315	--	564	1000	450	760	1441	200	1080	2760	5850
1983	1850	2470	--	591	2000	850	1280	1441	400	1080	5530	6432
1984	3525	3020	--	645	1500	1350	1400	1457	700	1080	7125	7552
1985	5150	3620	--	705	1500	1850	1200	1457	1400	1180	9250	8812
1986	3400	5870	--	828	2500	1950	1100	1470	2200	1280	9200	11398
1987	2500	7440	--	962	3000	2350	200	1525	1000	1880	6700	14157
1988	3000	7540	--	1007	1500	2850	--	1587	--	2180	4500	15164
1989	2500	7540	--	1072	1500	3550	--	1587	--	2780	4000	16484
1990	2000	10040	--	1212	2500	3850	--	1587	--	2780	4500	19469

*Includes two mines located in Pitkin County and a Utah oil shale facility, both of which will have impacts on the case study area, and the construction of an electric utility's transmission lines which will take place in more than one county.

EXHIBIT A-7. COMPARISON OF TIMING OF OIL SHALE FACILITY SCENARIO II AND SENSITIVITY ANALYSIS 1

	Scenario II		Sensitivity Analysis 1	
	Temporary Employment	Operating Employment	Temporary Employment	Operating Employment
1977		25		25
1978	150	25	150	25
1979	300	125	300	125
1980		275	300	125
1981		275	300	125
1982	300	300		275
1983	550	350		275
1984	1025	650	300	300
1985	1550	1150	550	350
1986	600	1500	1025	650
1987		1720	1550	1150
1988		1720	600	1500
1989		1720		1720
1990		1720		1720

appropriate sections in this volume which discuss the individual factors being analyzed. Each sensitivity analysis was based on the Scenario II development pattern.

Sensitivity Analysis 2.	Settlement patterns are changed--Meeker population lowered, C-a road build. (See Section E: Geographic Distribution of Impacts),
Sensitivity Analyses 3.a&b	Employment multipliers are (a) lowered and (b) raised. (See Section C: Indirect Economic Activity),
Sensitivity Analysis 4.	The operating and capital costs are based on other studies rather than the appropriate budgets. (See Section F: Public Finance),
Sensitivity Analysis 5.a,b,&c	The lag and construction accelerator are varied (See Section C: Indirect Economic Activity).

Results. Exhibit A-8 shows the changes in total employment associated with the two basic scenarios. In Scenario I, Rio Blanco County's employment rises slightly during the first two years when oil shale development begins. Then, as oil shale operations cease, employment decreases. In Year 13, it is about 250 less than in Year 0. In Scenario II, county employment increases more then tenfold by Year 13. This is due primarily to the fact that commercialization of oil shale takes place.

Sensitivity Analysis. In the sensitivity analysis, county employment increases, but at a slightly slower rate and peaks at approximately 3,500 less than in Scenario II. These results are shown in Exhibit A-9.

EXHIBIT A-8. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, RIO BLANCO COUNTY

The Results of Scenario I and II

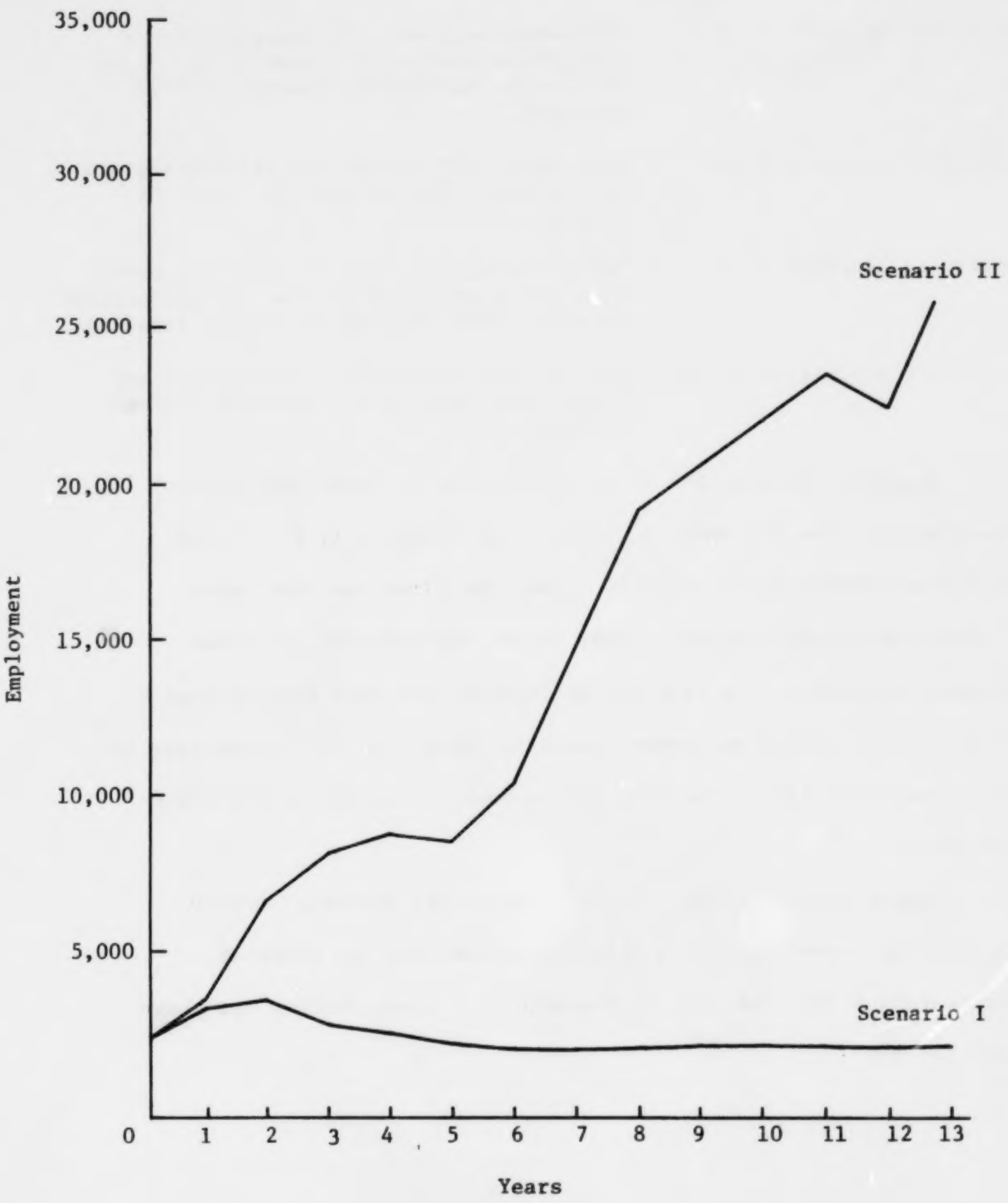
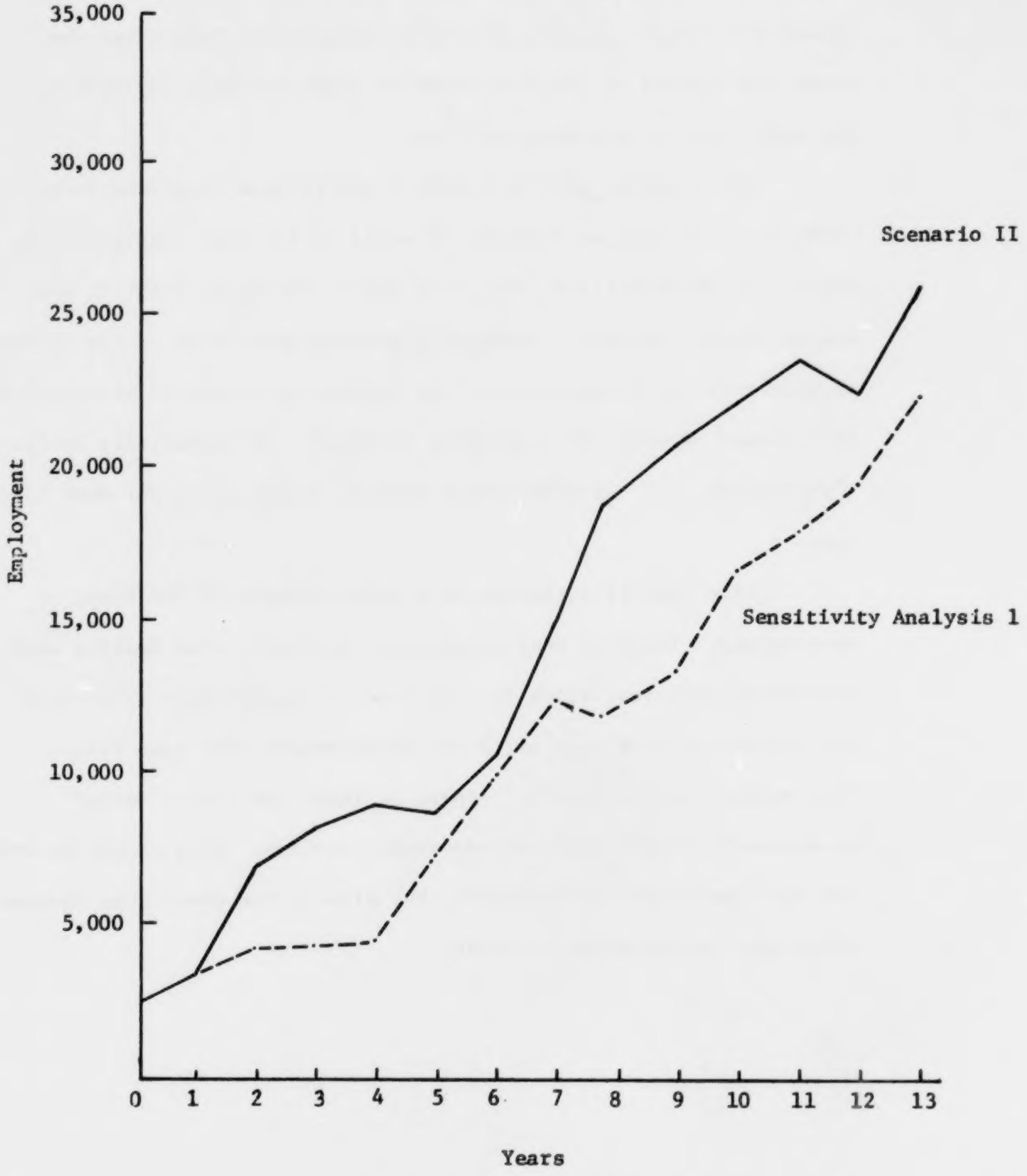


EXHIBIT A-9. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Extending the Period of Oil Shale Development (S.A. 1)



Implications. Energy development scenarios should only be considered to be complete at the point when they must be put into the computer. Generally speaking, industry plans should not be considered static; changes are always occurring. Most often the plans are altered in terms of start-up times or total employment, but other factors are also involved.

For example, when Scenarios I and II were finalized in April 1978, it appeared that Scenario II would be the most likely to take place. By December 1978, when this report was being written, that was no longer the case. Industry's growing skepticism of the technology coupled with the uncertainty of the federal government's attitude toward development of this resource makes Scenario I or Sensitivity Analysis 1 ("stretching" out the development period) appear to be the most likely case.

This type of situation is a prime example of two types of uncertainty. There is poor predictive capability when dealing with government policies, which in turn leads to uncertainty as to when the events (in this case oil shale development) will take place. This emphasizes the need to prepare at least two likely energy development scenarios in any assessment process. This should be done not only for comparison purposes, but also in the event that changes affecting the scenarios do occur.

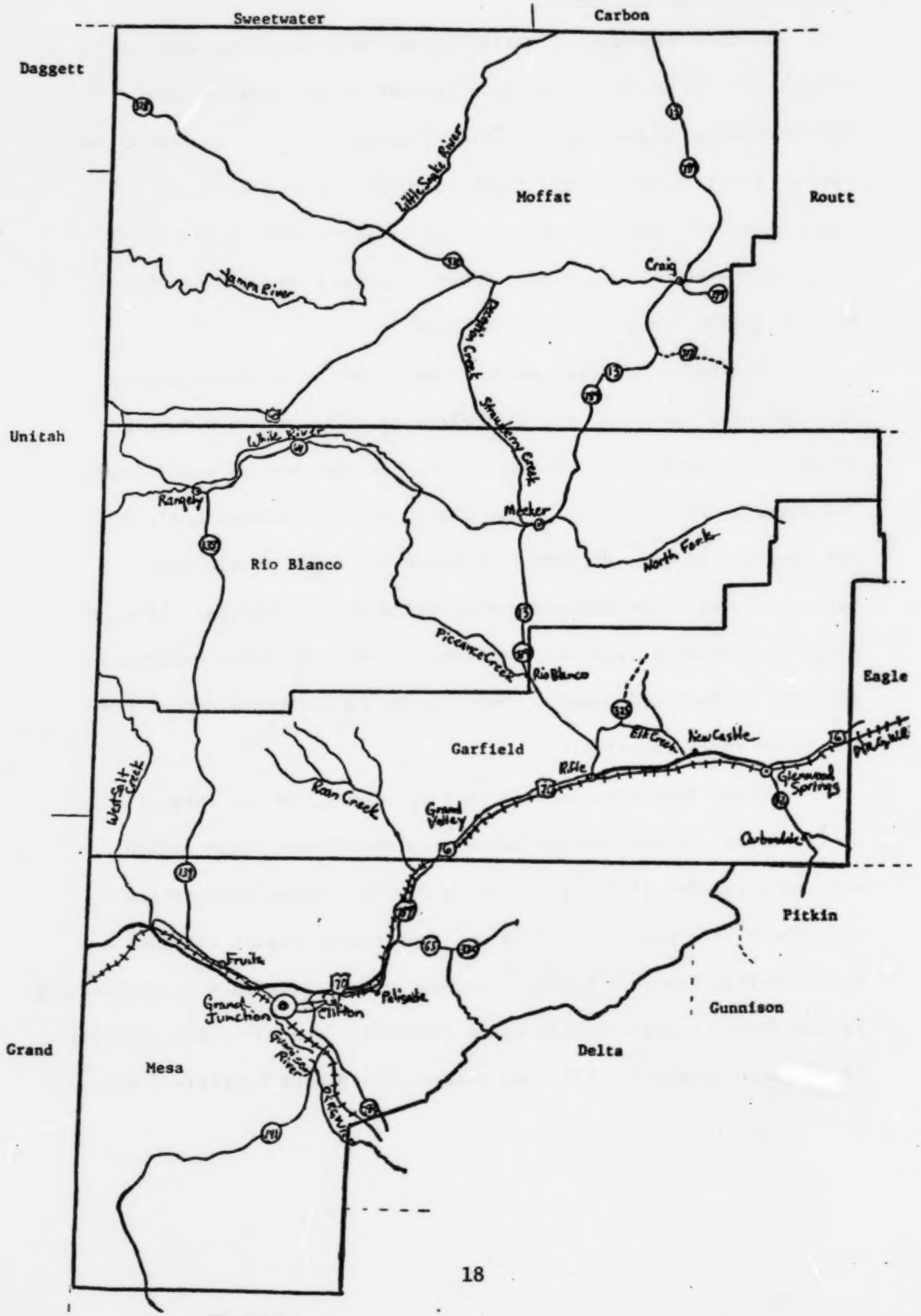
B. The Existing Community

Moffat, Rio Blanco, Garfield, and Mesa Counties, located in northwestern Colorado, cover 13.8 percent of the state's land area. The topography of the region varies from desert and plateaus on the west to fertile valleys and forested mountains on the east. The Colorado River flows through the region, as do some of its major tributaries--the White, Yampa, Green, Gunnison, and Dolores Rivers. Exhibit B-1 is a map of the study area.

Northwest Colorado has a large number of proposed energy developments, involving a wide variety of different resources and different technologies. Moffat County has substantial coal mining and power plant activities. Rio Blanco County includes coal, oil and gas, and several different proposed oil shale developments. Garfield County also includes major oil shale activities. Also, a large proportion of the new Rio Blanco County oil shale employees may live in Garfield County. Mesa County is the trade center for the other three counties.

Grand Junction, located in Mesa County, is the largest city in the state, outside of the Denver-centered front range region, with an estimated 1977 population of 25,398. Other communities (and their 1977 populations) in the four-county region include: Craig (Moffat County)--6,677; Glenwood Springs (Garfield County)--4,091; Fruita (Mesa County)--2,328; Rifle (Garfield County)--2,244; Rangely (Rio Blanco County)--1,871; and Meeker (Rio Blanco County)--1,848.[3]

EXHIBIT B-1. MAP OF NORTHEAST COLORADO CASE STUDY AREA


Sweetwater
Carbon
Daggett
Moffat
Routt
Little Snake River
Yampa River
Craig
Douglas Creek
Strawberry Creek
Unitah
White River
Rangely
Meeker
North Fork
Rio Blanco
Piceance Creek
Rio Blanco
Eagle
Elk Creek
New Castle
Rifle
Glenwood Springs
Carbondale
Garfield
Roan Creek
Grand Valley
West Salt Creek
Pitkin
Fruita
Grand Junction
Clifton
Palisade
Gunnison River
Gunnison
Grand
Mesa
Delta
Montrose
13
789
40
64
139
325
6
70
82
65
141

Delineation of the study area. The study area represents a relatively self-contained regional economy.* This makes some elements of the assessment process easier to implement and provides more validity for results. (For example, the derivation of the relationship between basic and nonbasic employment is generally considered to be easier, and the results more valid, in a relatively self-contained economy.) However, the size of the study area and the large number of local jurisdictions it encompasses present operational problems. In particular, to analyze each local jurisdiction's fiscal impacts in detail would be quite expensive. This case study has included public finance analyses only for those local jurisdictions which are expected to receive major impacts--Rio Blanco County, the Town of Meeker, and Rio Blanco School District RE-1. However, the techniques used are replicable for other jurisdictions as needed.

Economic base description. Agriculture and mining were the largest economic sectors in the region until recent decades. Early settlers were attracted by mineral deposits and rangeland for cattle and sheep grazing. Later, irrigated farming and raising of forage emerged as major activities. Today, wholesale and retail trade is the largest employment sector in the region, reflecting, in part, Grand Junction's importance as the commercial center for the Western Slope. Government and services are also major employers.

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*There is still significant commuting to and trading with counties contiguous to the study area, particularly the Utah counties to the west of the study area.

Agriculture is a larger employer than either manufacturing or mining. Major crops include almost all of the state's peaches and pears as well as some apples and cherries. The region also produces hay, barley, and sugar beets. The rangelands, particularly of the northern counties, are used for raising sheep and cattle.

The four-county region has experienced several boom-bust cycles of mineral resource development due to the varying demand for coal and uranium. In addition, commercial oil shale activities have previously been predicted several times. Now all types of energy development in the region are once again on the upswing. In 1976, the region produced $219 million worth of petroleum, and $22 million worth of natural gas. Combined with smaller quantities of coal, uranium, and vanadium, the region's total mineral production was over $254 million, or 23 percent of the value of all minerals produced in the state.[4]

Procedure--employment. The base case employment projections by county (see Exhibits B-2 through B-5 for basic and Exhibit B-6 for nonbasic) were made for ten major employment categories. Estimates were based on Department of Commerce Regional Economic Information System (REIS) data for the most recent year available which was 1975. First, the 1975 figures were adjusted to a 1977 level based on the average growth rate per sector from 1971-1975. Then, the sectors

EXHIBIT B-2. ESTIMATES OF BASIC BASE CASE EMPLOYMENT IN RIO BLANCO COUNTY

	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Agriculture	338	331	324	318	312	305	299	293	287	281	276	270	265	260
Manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	372	372	372	372	372	372	372	372	372	372	372	372	372	372
Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T.C. & U.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Services*	47	47	47	47	47	47	47	47	47	47	47	47	47	47
Federal Government	59	60	60	61	61	62	63	63	64	65	65	66	66	67
State & Local Government	375	375	375	375	375	375	375	375	375	375	375	375	375	375
Wholesale & Retail Trade	26	26	27	27	27	27	28	28	28	28	29	29	29	30
F.I.R.E.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1,217	1,211	1,205	1,200	1,194	1,188	1,184	1,178	1,173	1,168	1,164	1,159	1,154	1,154

*Includes other

7/27/.

EXHIBIT B-3. ESTIMATES OF BASIC BASE CASE EMPLOYMENT IN MESA COUNTY

	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Agriculture	1,983	1,943	1,904	1,866	1,829	1,792	1,756	1,721	1,687	1,653	1,620	1,588	1,556	1,525
Manufacturing	2,189	2,255	2,322	2,392	2,464	2,538	2,614	2,692	2,773	2,856	2,942	3,030	3,121	3,215
Mining	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011
Construction	429	433	438	442	446	451	455	460	465	469	474	478	484	488
T.C. & U.	766	789	813	837	862	888	915	942	970	999	1,029	1,060	1,092	1,125
Services	2,400	2,479	2,546	2,623	2,701	2,782	2,866	2,952	3,040	3,131	3,225	3,322	3,422	3,525
Federal Government	760	767	775	783	791	799	807	815	823	831	840	848	856	865
State & Local Government	1,771	1,789	1,807	1,825	1,843	1,861	1,880	1,899	1,918	1,937	1,956	1,976	1,996	2,015
Wholesale & Retail Trade	1,796	1,850	1,905	1,962	2,021	2,082	2,144	2,209	2,275	2,343	2,414	2,486	2,561	2,637
F.I.R.E.	86	88	91	94	97	100	103	106	109	112	115	119	122	126
TOTAL	13,191	13,404	13,612	13,835	14,065	14,304	14,551	14,807	15,071	15,342	15,626	15,918	16,221	16,532

7/27/78

EXHIBIT B-4. ESTIMATES OF BASIC BASE CASE EMPLOYMENT IN GARFIELD COUNTY

	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Agriculture	526	515	505	495	485	475	466	457	448	439	430	421	413	405
Manufacturing	132	136	140	144	149	153	158	162	167	172	177	183	188	194
Mining	433	433	433	433	433	433	433	433	433	433	433	433	433	433
Construction	206	208	210	212	214	217	219	221	223	225	228	230	232	234
T.C. & U.	197	203	209	215	222	228	235	242	250	257	265	273	281	289
Services	595	613	631	650	670	690	710	732	754	776	800	824	848	874
Federal Government	169	171	172	174	176	178	179	181	183	185	187	189	190	192
State & Local Government	309	312	315	318	322	325	328	331	335	338	341	345	348	352
Wholesale & Retail Trade	441	445	450	454	459	463	468	473	478	482	487	492	497	502
F.I.R.E.	65	67	69	71	73	75	78	80	82	85	88	90	93	95
TOTAL	3,073	3,103	3,134	3,166	3,203	3,237	3,274	3,312	3,353	3,392	3,436	3,480	3,523	3,570

7/27/78

EXHIBIT B-5. ESTIMATES OF BASIC BASE CASE EMPLOYMENT IN MOFFAT COUNTY

	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Agriculture	524	514	503	493	483	474	464	455	446	437	428	420	411	403
Manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	207	207	207	207	207	207	207	207	207	207	207	207	207	207
Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T.C. & U.	115	115	115	115	115	115	115	115	115	115	115	115	115	115
Services	225	227	230	232	234	236	239	241	244	246	249	251	254	256
Federal Government	94	95	96	97	98	99	100	101	102	103	104	105	106	107
State & Local Government	185	187	189	191	193	194	196	198	200	202	204	206	208	211
Wholesale & Retail Trade	219	221	223	226	228	230	232	235	237	240	242	244	247	249
F.I.R.E.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1,569	1,566	1,563	1,561	1,558	1,555	1,553	1,552	1,551	1,550	1,549	1,548	1,548	1,548

EXHIBIT B-6. ESTIMATES OF NONBASIC EMPLOYMENT FOR 1977

	Moffat	Mesa	Rio Blanco	Garfield
Agriculture	28	105	18	28
Manufacturing	52	394	32	61
Mining	17	302	0	58
Construction	221	1,738	72	461
T.C. & U.	130	1,153	147	485
Services*	768	5,210	422	1,973
Federal Government	10	190	7	19
State & Local Government	371	3,123	293	582
Wholesale & Retail Trade	639	5,031	232	1,056
F.I.R.E.	131	846	38	294
TOTAL	2,367	18,092	1,261	5,017

*Includes other and non-farm proprietors (and services).

Based on U.S. Department of Commerce Regional Economic Information System (REIS) data, for 1975.

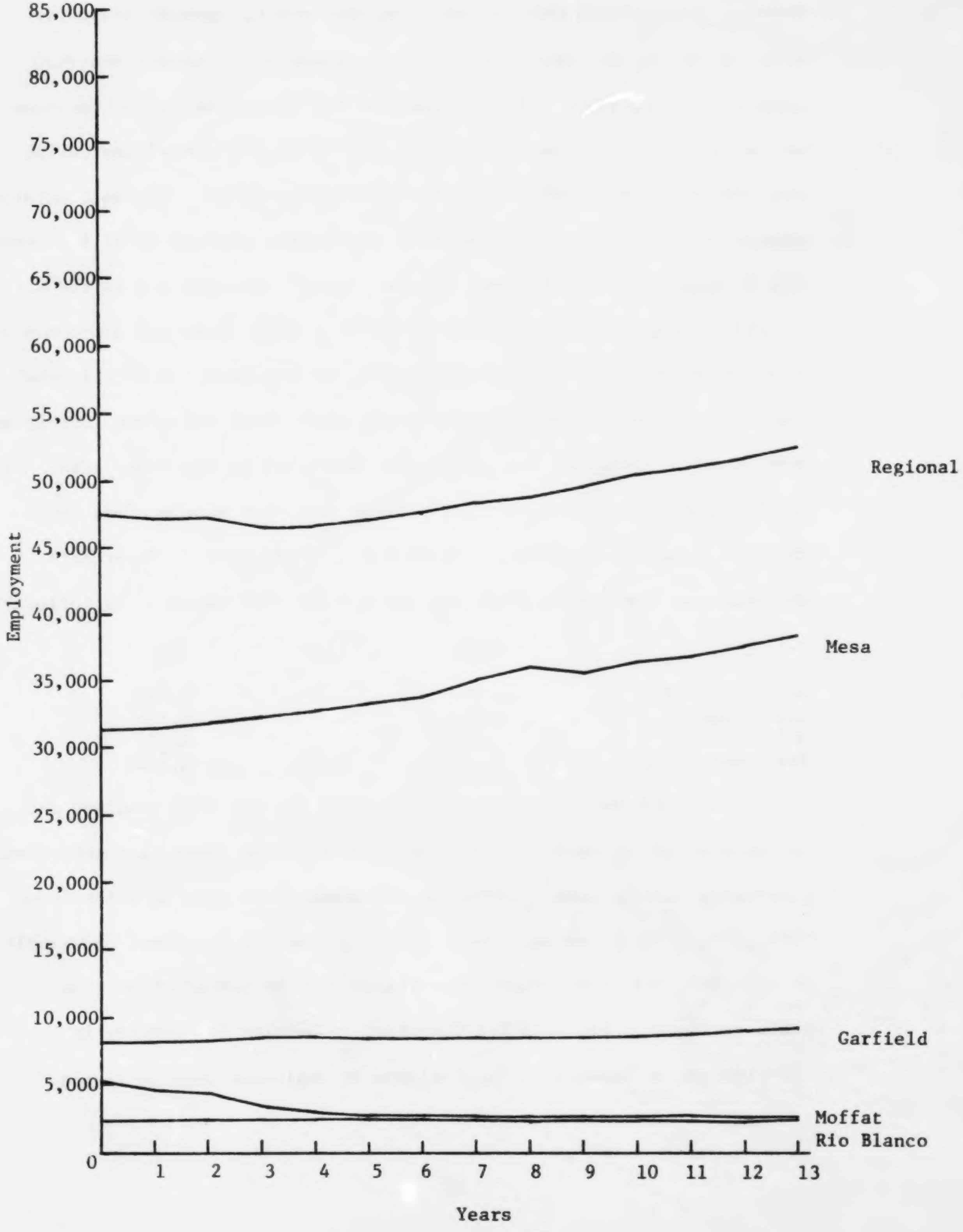
were divided into basic and nonbasic employment using a modified location quotient approach[5] (see Section C: Indirect Economic Activity). Once the ten sectors were divided into basic and nonbasic components, growth rate projections were made for 1978 through 1990 for basic employment in each sector, based on past trends and local opinions of industry prospects in the case study area. Total employment was projected using the same employment multiplier approach which was used in estimating energy-related employment (see Section C: Indirect Economic Activity). The resulting base case projections are shown on Exhibit B-7.

Results--employment. As seen from Exhibit B-7, Mesa County shows a moderate increase in base case employment and Garfield County a smaller increase. These increases reflect growth primarily in the trade and service sectors of the economy. Moffat County's employment decreases substantially by Year 4 as construction workers leave due to the completion of the power plant and then more gradually as the agricultural sector declines. Likewise, Rio Blanco's employment declines.

Two main problems occurred with the approach used for projecting employment. The first is that employment data at the level of detail needed were from 1975. The 1977 level had to be estimated. Second, the division of employment into basic and nonbasic components depended heavily upon DRI's familiarity with the region. In an area for which there was less first-hand information, it would have been necessary to use more formalized techniques (e.g., location quotients which have not been judgmentally adjusted) or some other less subjective technique (e.g., minimum requirements, shift share, etc.).

EXHIBIT B-7. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, REGIONAL AND BY COUNTY

The Results of the Base Case



Procedure--population. During the 1960's, Garfield and Mesa Counties gained in population (23.3 percent and 7.2 percent respectively), while Moffat and Rio Blanco experienced losses (-7.6 percent and -6.0 percent respectively). The decrease for Rio Blanco and Moffat Counties may be attributed to the cyclical decline in mineral activities during that period. Since 1970, this trend has been reversed. The most notable example is Moffat County, which had a population increase of 57.9 percent over a seven year period. Most of the county's increase was in the City of Craig which, due to the construction of a power plant and increased oil activity nearby, attracted a large number of newcomers. Garfield County's population has increased by 26.9 percent since 1970, which can largely be attributed to increased tourism in the county and in the Aspen area. Mesa County showed an increase of 22.9 percent over that same period, while Rio Blanco County's population increased only slightly (5.3 percent). The counties' population from 1960 through 1977 are reported as follows:[6]

	1960	1970	1977
Garfield County	12,017	14,821	18,800
Mesa County	50,715	54,374	66,848
Moffat County	7,061	6,525	10,303
Rio Blanco County	5,150	4,842	5,100

The base case population projections for the four counties and the Town of Meeker were derived from three factors: base case employment, geographic distribution of workers, and assumptions used in determining family size. Once new employment was projected (as discussed previously in this section), the workers were distributed by jurisdiction (the basic assumptions for this are discussed in Section D: Geographic Distribution of Impacts). The division of employees into basic and nonbasic components with basic further divided into energy-related, construction and mining and all other workers allows the determination of family size. Exhibit B-8 lists the assumptions used to estimate types of households and the number of school age children.* See Exhibit B-9 for base case population by county and for the Town of Meeker.

Results--population. The base case population projections, in general, show the same trends as base case employment. Mesa and Garfield show population increases, while Moffat and Rio Blanco show losses. By Year 13, Rio Blanco's population is larger than Moffat's.

Implications. Base case projections of employment and population are valuable for comparative purposes. The differences between the baseline estimates and those including the various anticipated energy developments give an indication of net impacts--those which can be attributed to energy development.

In general, the accuracy of baseline projections depends heavily on the availability of current data, analysis of past trends, and the analyst's knowledge of the area. For example, the continual growth in employment and population in Mesa County is a reasonable assumption given the knowledge that Grand Junction, the regional trade center, is located in the county.

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*Using the figures in Exhibit B-8, the following example illustrates the estimating process: If in Garfield County there are 100 construction workers, 60 of those are assumed to be head of household and 40 are classified as living alone; the total construction worker population (60 x 3.59 + 40) is 255. The problems with this approach are discussed in Section E: Population and Income.

EXHIBIT B-8. ASSUMPTIONS USED IN DETERMINING FAMILY SIZE

	Head of Household[a]	Living Alone	Nonhead of Household	TOTAL
BASIC EMPLOYEES				
Energy-Related Construction	0.60	0.40	-	1.00
Mining and All Others	0.80	0.10	0.10	1.00
NONBASIC EMPLOYEES	0.60	0.10	0.30	1.00

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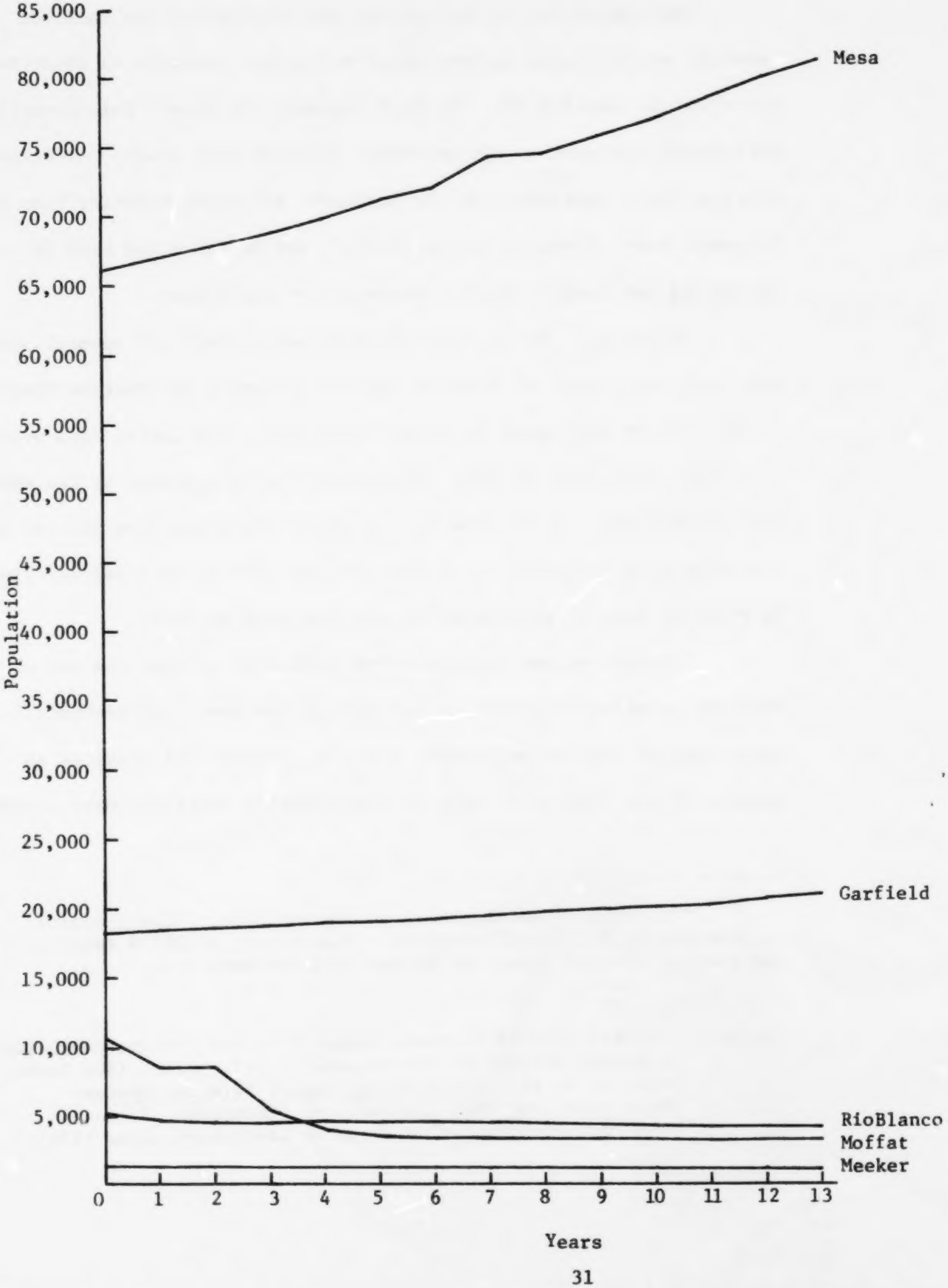
[a] Construction worker households are assumed to contain an average of 3.59 persons, all others 3.55. Each construction family is assumed to have .92 school age children and all others .91 school age children.

Source: John S. Gilmore and Mary Duff, A Growth Management Case Study: Sweetwater County, Wyoming (Denver, Colorado: Denver Research Institute, University of Denver, 1975) and Mountain West Research, Inc., Construction Worker Profile Final Report (Washington, D.C.: Old West Regional Commission, December 1975).

EXHIBIT B-9. TOTAL POPULATION, BY COUNTY AND FOR MEEKER

The Results of the Base Case



C. Indirect Economic Activity

The demonstration methodology for calculating the indirect economic activity uses an employment multiplier approach as described in Volume II, Section IV: Indirect Economic Activity. This general methodology was used in the northwest Colorado case study. Location quotient data, available for the Colorado case study counties from the Economic Impact Forecast System (EIFS)*, was modified and used in estimating the basic/nonbasic components of employment.

Procedure. Due to the fact that census data are several years old, U.S. Department of Commerce Regional Economic Information System (REIS) data on employment by county were used. The latest data available cover the years 1971 to 1975. Employment was categorized by ten employment categories modified from the one-digit SIC codes (see Section B: The Existing Community). A growth rate for 1971 to 1975 was calculated in order to project employment to the base year of 1977.

Information was available from EIFS that allowed the use of modified location quotients in determining the basic and nonbasic components of the ten employment sectors. Exhibit C-1 provides an example of the EIFS model output. The location quotients were reviewed

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*In the EIFS model, local export employment (i.e., basic) is provided by SIC classifications. This model, at DRI's request, was run for the four counties in the Colorado case study.[7]

Source: Computer runs on Economic Impact Forecast System, conducted by Ronald Webster at the request of DRI, 1978. (See Ronald Webster, et al., The Economic Impact Forecast System: Description and User Instructions [Champaign, Illinois: Construction Engineering Research Laboratory, June 1976]).

EXHIBIT C-1. LOCATION QUOTIENTS FOR MESA COUNTY DERIVED FROM THE ECONOMIC IMPACT FORECAST SYSTEM

Reproduced from best available copy.

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xport (Basic) Employment Profile

ymbols:
ir  is local employment in industy i
*r  is total local employment
i*  is national employment in industry i
**  is total national employment
ir  is local export employment in industry i
*r  is total local export employment
ll ratios are percentages.

IC        Eir       Xir         LQ   Xir/Eir  Xir/E*r  Xir/X*r  Eir/E*r  Ei*/E**
==        ===       ===         ==   =======  =======  =======  =======  =======
---     16701      6853      1.696    41.032   41.032  100.000  100.000  100.000
7--        64        23      1.549    35.429    0.136    0.331    0.383    0.279
700        64        23      1.549    35.429    0.136    0.331    0.383    0.247
0--       434       334      4.355    77.038    2.002    4.879    2.599    0.815
000       152       171  *********   112.371    1.023    2.493    0.910    0.105
090       172       171    143.804    99.305    1.023    2.493    1.030    0.009
094       172       171    143.804    99.305    1.023    2.493    1.030    0.007
300       110        63      2.320    56.895    0.375    0.913    0.659    0.284
49a       106        94      8.525    88.270    0.560    1.365    0.635    0.074
5--       909       180      1.246    19.748    1.075    2.619    5.443    4.635
500       254        33      1.150    13.058    0.199    0.484    1.521    1.322
600       206        78      1.609    37.848    0.467    1.138    1.233    0.831
610       128        78      2.558    60.911    0.467    1.138    0.766    0.300
620        78         0      1.000                                0.467    0.530
700       449        68      1.180    15.228    0.409    0.998    2.688    2.442
710        85         0      1.000                                0.509    0.594
790        62         0      1.000                                0.371    0.449
9--      1652      1400      6.557    84.748    8.383   20.431    9.892   25.499
000       237       123      2.077    51.863    0.736    1.794    1.419    2.095
020       152       123      5.226    80.865    0.736    1.794    0.910    0.253
```

Source: Computer runs on Economic Impact Forecast System, conducted by Ronald Webster at the request of DRI, 1978, op. cit., p. 32.

and modified to reflect knowledge of the local area's purchasing and consuming patterns.* Exhibit C-2 reflects this step for Rio Blanco County.**

An employment multiplier for the four-county area was calculated based on the basic/nonbasic split in employment. The existing four-county multiplier was calculated as follows:

	Basic Employment	Nonbasic Employment
Garfield	3,073	5,017
Mesa	13,191	18,092
Moffat	1,569	2,367
Rio Blanco	1,217	1,261
	19,050	26,737

$$\text{Existing multiplier} = \frac{26,737}{19,050} = 1.4$$

However, the incremental multiplier (new nonbasic jobs, divided by new basic jobs), which was assumed to be lower than the existing multiplier throughout the study period was used instead of the computed existing multiplier. Because of the magnitude of basic growth involved, it should be a very long time before nonbasic activity

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*For regions with a small economic base, an analyst with knowledge of the area can almost always improve upon the location quotient approach. An "a priori" approach for dividing employment into basic and nonbasic is discussed by J.A. Chalmers and E.J. Anderson.[8] This "a priori" or deductive reasoning approach uses a firm's industry classification and products together with locally derived information and classifies the firm accordingly. Chalmers and Anderson cite some general observations and approaches to the classification of basic and nonbasic employment by industry which were used in the case studies.

**Basic base case employment (years 1977-90) was calculated outside the computer model (see Section B: The Existing Community). The 1977 nonbasic employment was also an input to the model, but base case nonbasic employment (years 1978-90) was projected within the model using a computed multiplier.

EXHIBIT C-2. EXAMPLE OF THE DETERMINATION OF BASIC AND NONBASIC COMPONENTS, RIO BLANCO COUNTY

	1977 (total)	% Basic	Basic Employment	Nonbasic Employment
Agriculture	356	95%	338	18
Manufacturing	32	0%	0	32
Mining	372	100%	372	0
Construction	72	0%	0	72
T. C. & U.	147	0%	0	147
Services	469	10%	47	422
Federal Government	66	90%	59	7
State & Local Government	668	56.19%	375	293
Wholesale & Retail Trade	258	10%	26	232
F.I.R.E.	38	0%	0	38

completely responds. For this reason, an incremental multiplier of 1.2 was used to generate a nonbasic work force for the base case basic employment and for the new operating work force. The multiplier for the temporary construction work force was .6 (or one-half of the permanent work force multiplier).

As explained in Volume II, a lag of three years was used in the Colorado case study.* What this means, in effect, is that if in Year 3 a total of 1,000 new basic employees are coming into the area, they will generate a new nonbasic work force of 1,200 (using a 1.2 multiplier). A three year lag will cause only 400 of the total employees to enter the population in Year 3. In Year 4 another 400 will be added and in Year 5 the remaining one-third will be part of the total population.

Further adjustments to the multiplier included use of an accelerator to account for increases in nonbasic construction activity. The new employment generated by the accelerator was lagged over a two year period.** (See Volume II, Section IV: Indirect Economic Activity for a detailed description of the accelerator).

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*Generally, in impacted communities, investments in nonbasic activities are delayed by a combination of economic and institutional factors. The lags used in the model are assumed to affect the computed nonbasic component of total employees and the additional employees computed by the accelerator effect.

**The accelerator principle is based on the fact that during periods of rapid community growth, the existing nonbasic capital stock is quickly absorbed by nonbasic industries. Continued growth requires a large number of construction workers just to increase the capital stock. Also, each new capital construction worker demands nonbasic goods and services which require further capital additions. The accelerator formula used in the model is given below.

Results. Exhibit C-3 presents the resulting forecasts of total employment for Rio Blanco County for Scenarios I and II. The large differences in total employment reflect differences in basic energy-related jobs. They occur because of commercialization of oil shale assumed for Scenario II.

Sensitivity analysis. The sensitivity analyses tested changes in the value of the multiplier, lag time and accelerator effects.

Multipliers. As discussed earlier, the construction and operating multipliers for Scenario II were .6 and 1.2 respectively. In Sensitivity Analysis 3a the construction and operating multipliers were both set at .5. Exhibit C-4 shows the effect upon Rio Blanco

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(footnote continued from previous page)

Total number of capital construction employees in time t is equal to:

$$C\cdot\Delta E_t\left(1+\frac{C\cdot NB}{1-(C\cdot NB)}\right)$$

and the additional nonbasic support in time t is equal to:

$$NB\cdot C\cdot\Delta E_t\left(1+\frac{C\cdot NB}{1-(C\cdot NB)}\right)$$

where:

ΔE_t = original change in employment

C = number of person years of capital construction required for each ΔE_t

NB = number of nonbasic employees required to provide the goods and services demanded by each C

For the Colorado simulations, both C and NB were set equal to .5. Therefore, the capital construction component of the accelerator equaled $.67\Delta E_t$ and the additional nonbasic component $.33\Delta E_t$.

EXHIBIT C-3. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, RIO BLANCO COUNTY

The Results of Scenario I and II

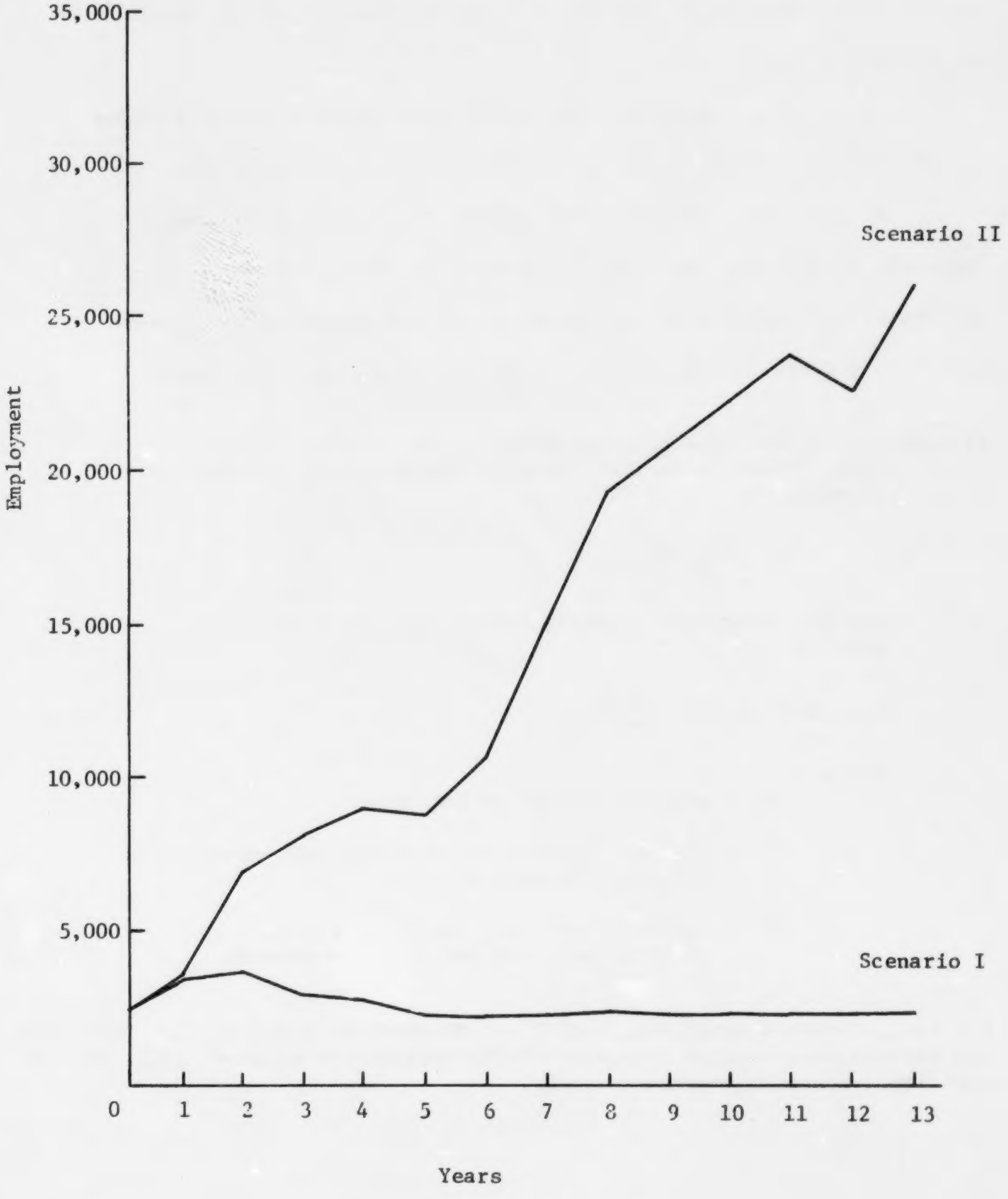
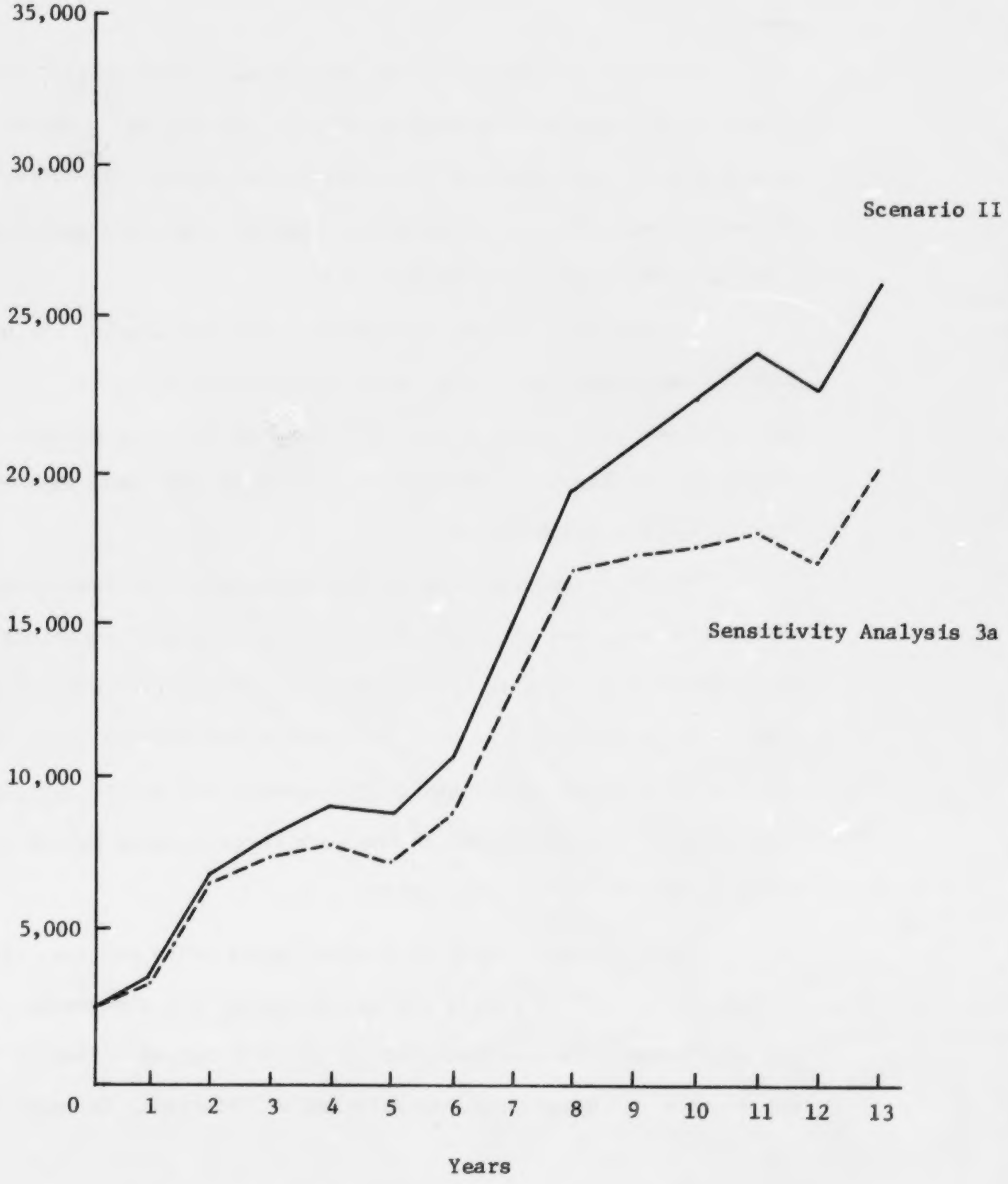


EXHIBIT C-4. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Lowering the Multiplier to .5 (Construction and Operating) (S.A. 3a)



County's employment. Until Year 7 the difference is minimal. After that the smaller multiplier had increasingly more effect, so that in Year 13 there are approximately 5,000 fewer employees in the county.

A second analysis (3b) was done using a construction multiplier of 1.0 and an operating multiplier of 1.5. As can be expected, this generated more employment in the county. But again, the difference is minimal through Year 7. Eventually, however, there are approximately 3,000 more employees. See Exhibit C-5.

Lag and accelerator. The period used for lagging the new nonbasic employment was three years in Scenarios I and II. A sensitivity test (5a) was done using a five year lag. As shown in Exhibit C-6, increasing the lag time had minimal effects on the total employment picture for Rio Blanco County.

Two analyses were done on the accelerator; in Sensitivity Analysis 5b none was used and, in 5c, the accelerator construction requirements and nonbasic support for the construction workers were reduced by 50 percent. As seen in Exhibits C-7 and C-8, both tests resulted in reduced employment in the county, but not by any significant amount. The difference in the work force between 5b and 5c is, in the long run, almost negligible.

Implications. Based on further sensitivity testing, the crucial factors in projecting future employment levels are the energy scenarios and settlement patterns (see Section A: Description of Energy Development and Section E: Geographic Distribution of Impacts). Changes in these

EXHIBIT C-5. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs.
Raising the Multiplier to 1.0 (Construction) and 1.5 (Operating) (S.A. 3b)

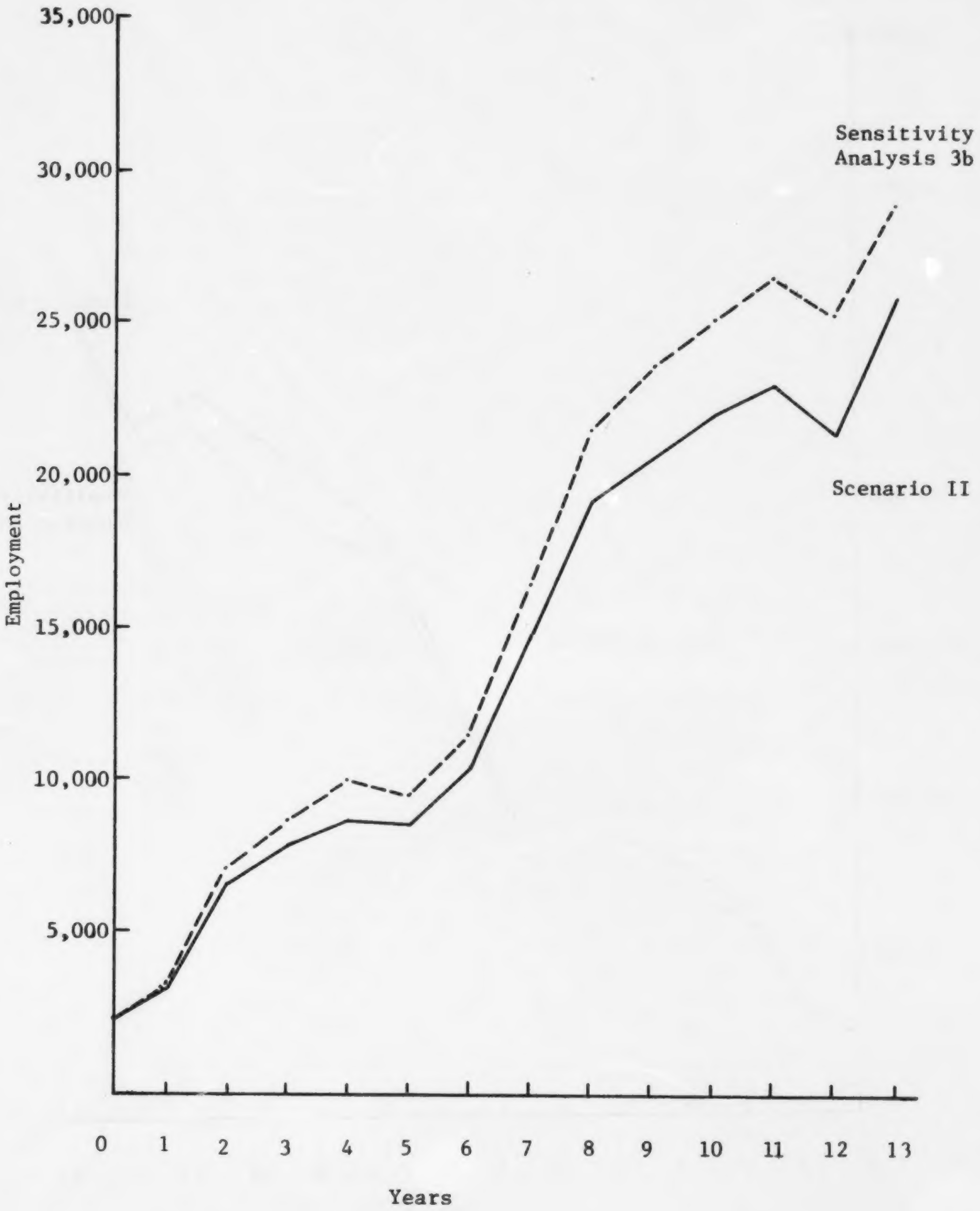


EXHIBIT C-6. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Extending the Multiplier Lag from Three to Five Years (S.A. 5a)

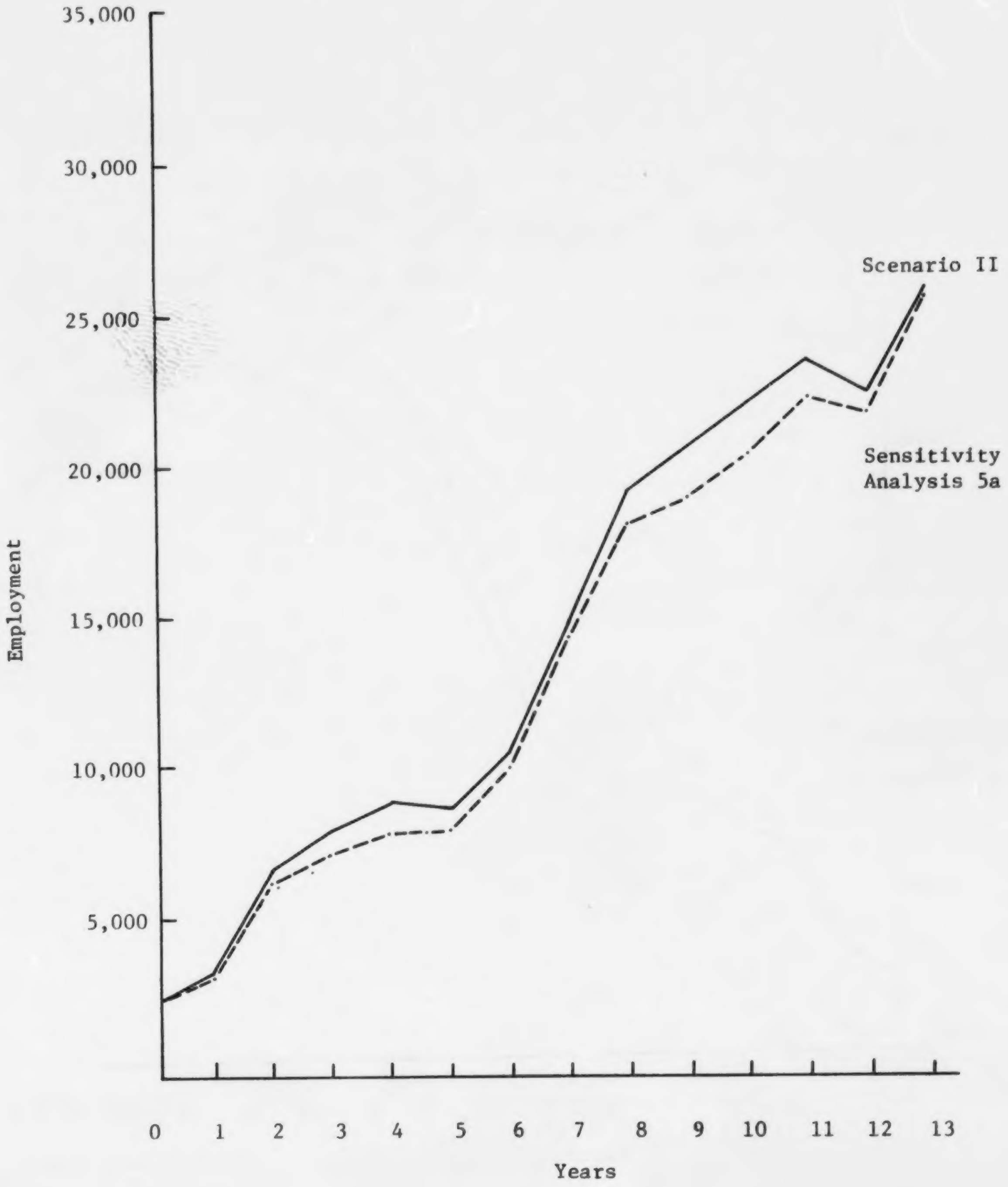


EXHIBIT C-7. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Using No Accelerator (S.A. 5b)

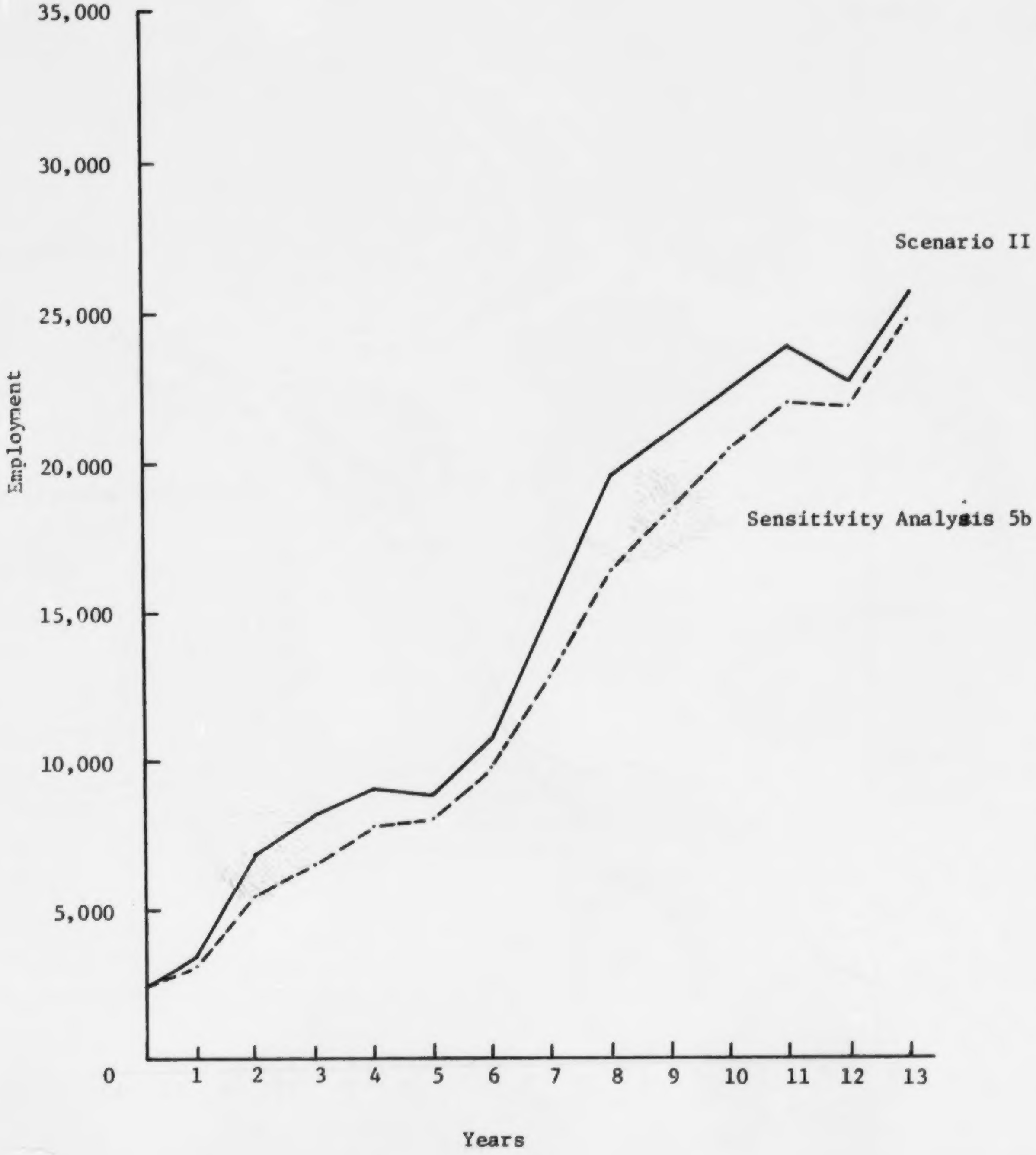
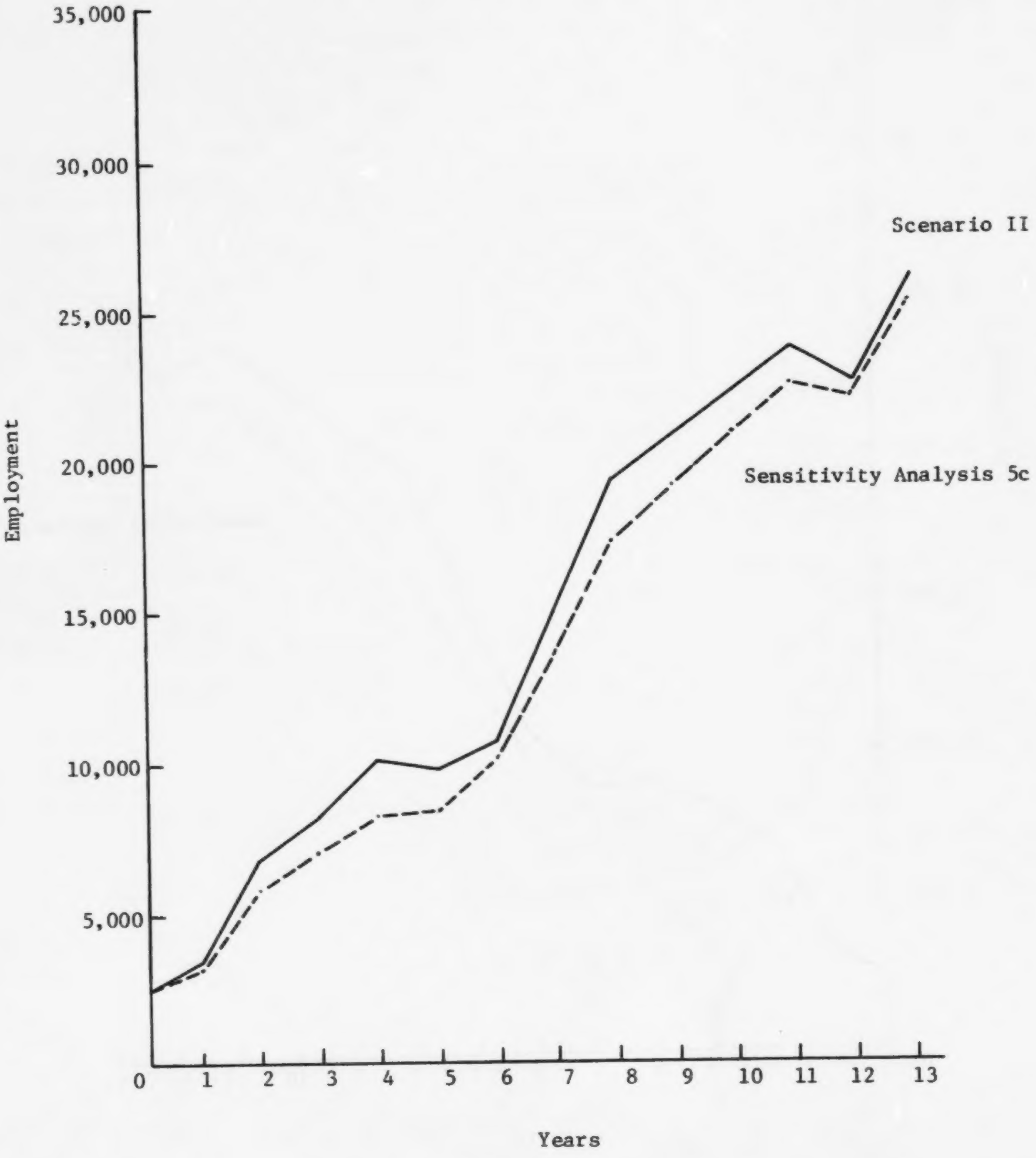


EXHIBIT C-8. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Reducing the Accelerator Requirements (S.A. 5c)



two areas have a much greater effect on county employment than variations in the multiplier, lag time or accelerator. While care should be taken to ascertain as accurate inputs as possible for the latter three, they are substantially less crucial than the energy scenarios and settlement patterns.

D. Population and Income

The corresponding section in Volume II discusses the issues involved in projecting population and incomes in a given region. The methodology presented there was used in the northwest Colorado case study. As was noted in Volume II, new employment is the basis for these projections. For a description of how the different aspects of employment were calculated see Volume III, Section A: Description of Energy Development (new basic); Section B: The Existing Community (baseline); and Section C: Indirect Economic Activity (nonbasic).

Procedure--population. New regional employment was calculated within the computer for each category--base case basic, project operating, temporary construction, and nonbasic. These totals were then distributed to each jurisdiction. (See Section E: Geographic Distribution of Impacts).

The assumptions concerning family status used in the first step of calculating new population are shown below. The figures are based on previous research done by DRI.[9]

	Head of Household	Living Alone	Nonhead of Household	TOTAL
BASIC EMPLOYEES				
Construction Energy-Related	0.60	0.40	-	1.00
Mining and All Others	0.80	0.10	0.10	1.00
NONBASIC EMPLOYEES	0.60	0.10	0.30	1.00

As an example of the use, assume 100 new mining employees in a given county. Of these, 80 would be heads of households, 10 would be living alone, and 10 would be nonheads of households. After a total number of new heads of households is derived for a county, the new family population is calculated using the figures presented below. These numbers are based on data from Construction Worker Profile[10] and knowledge of the area.

	Family Size	School Age Children
Construction	3.59	.92
All Other	3.55	.91

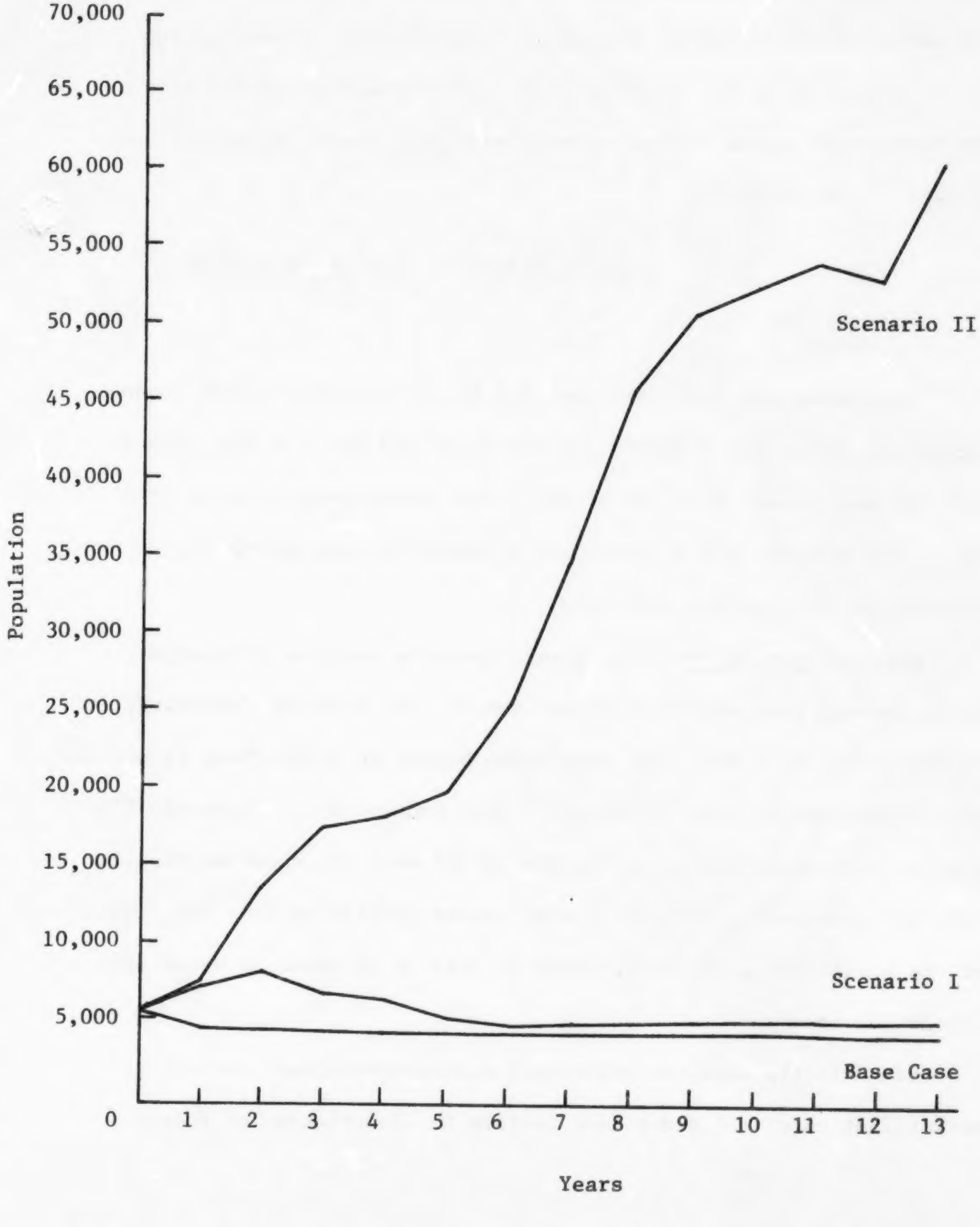
Continuing the above example, the 80 new nonconstruction heads of household would mean a family population of 284 (80 x 3.55), with a school age population of 73 (80 x .91). The family population is then added to the singles (284 + 10) to get a change in nonconstruction population of 294 over the base year.

Results--population. Rio Blanco County's baseline population, using the assumptions explained in Section B: The Existing Community, stays very close to 5,000. The population begins at 5,100 (Year 0) and gradually declines to 4,800 (Year 13). (See Exhibit D-1.) Scenario I's population increases rapidly during the period when oil shale development begins, but decreases after Year 2 when commercialization does not occur. After the population levels out, there is only an increase of about 600 people in the county.

Scenario II, with the additional energy development and with commercialization of oil shale (see Section A: Description of Energy

EXHIBIT D-1. TOTAL POPULATION, RIO BLANCO COUNTY

The Results of Scenario I and II and Base Case



Development) shows a tremendous increase in population. In the fourteen-year period about 56,200 more people move into Rio Blanco County, with over 20,000 of those coming between Years 7 and 9. (See Exhibit D-1.)

Sensitivity analysis--population. All but one of the sensitivity tests done with the computer affected population in some manner. In the first one, Scenario II for energy development was used, but the construction period for the oil shale projects was lengthened. The effects this had on Rio Blanco County's population is shown in Exhibit D-2. The increase is not quite as dramatic as that in Scenario II. While the final population is about ten times greater than it is at Year 0, it is still about 7,300 less than if development occurred as predicted in Scenario II. This difference is enough that it could affect the public finance aspects related to growth. (See Section F: Public Finance for further explanation.)

Changing the settlement patterns by building the road from C-a to Rangely* and increasing the number of Rio Blanco County local service employees living in Garfield, Mesa, and Moffat Counties have almost the same effect as decreasing multipliers. Both decrease the Meeker and Rio Blanco County population growth, with differences being greatest after Year 8. (See Exhibits D-3 and D-4.) As could be expected, increasing the multiplier has the opposite effect. Population is greater in the sensitivity test (S.A. 3b) than in Scenario II. Again, Year 8 is the point at which the

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*The C-a road, if built, would cut down the commuting distance from Rangely to the C-a tract from 68 miles to 25 miles, thereby diverting the population from Meeker and Rifle to Rangely.

EXHIBIT D-2. TOTAL POPULATION, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Extending the Period of Oil Shale Development (S.A. 1)

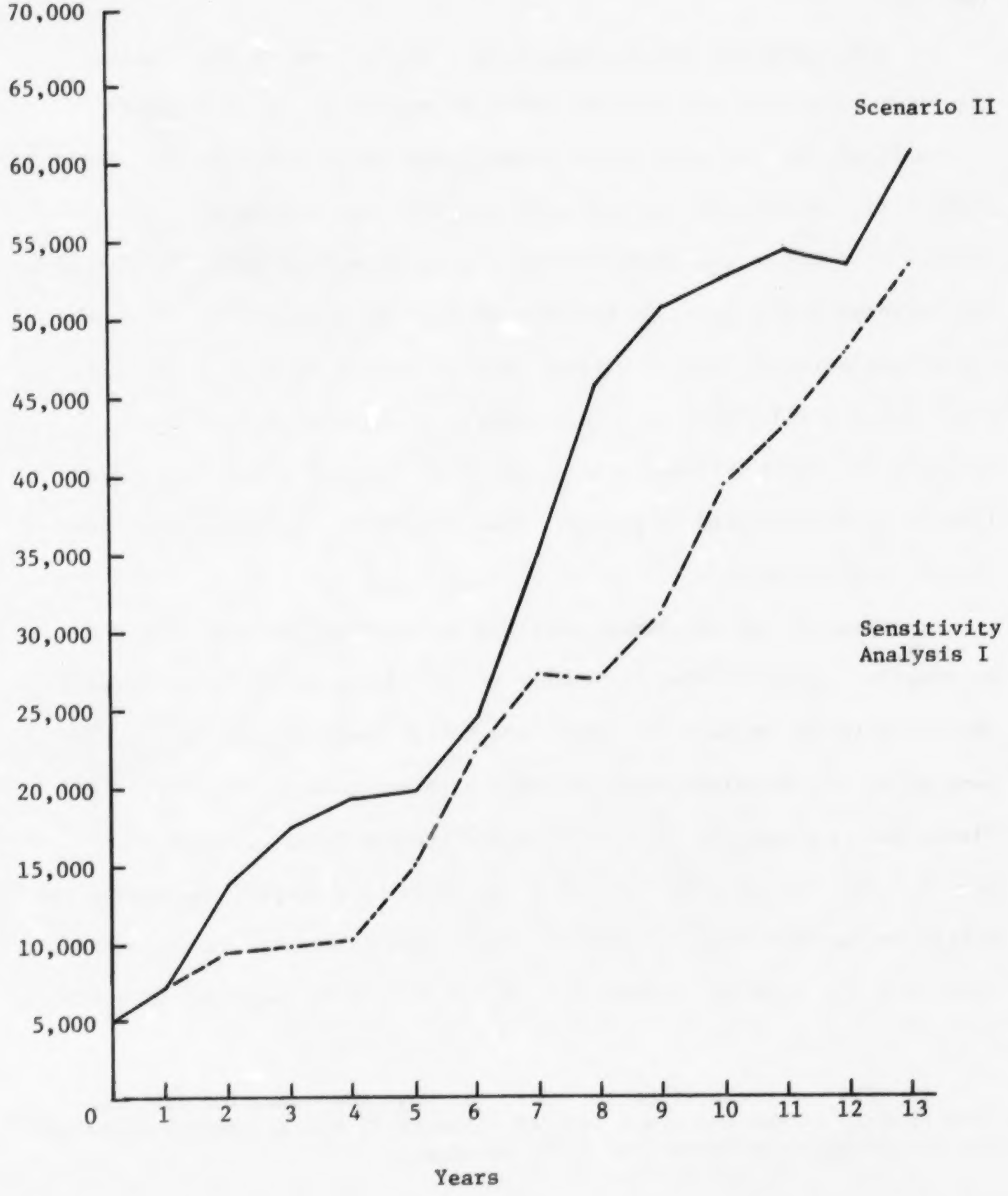


EXHIBIT D-3. TOTAL POPULATION, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Changing Settlement Patterns to Lower Meeker Population (S.A. 2)

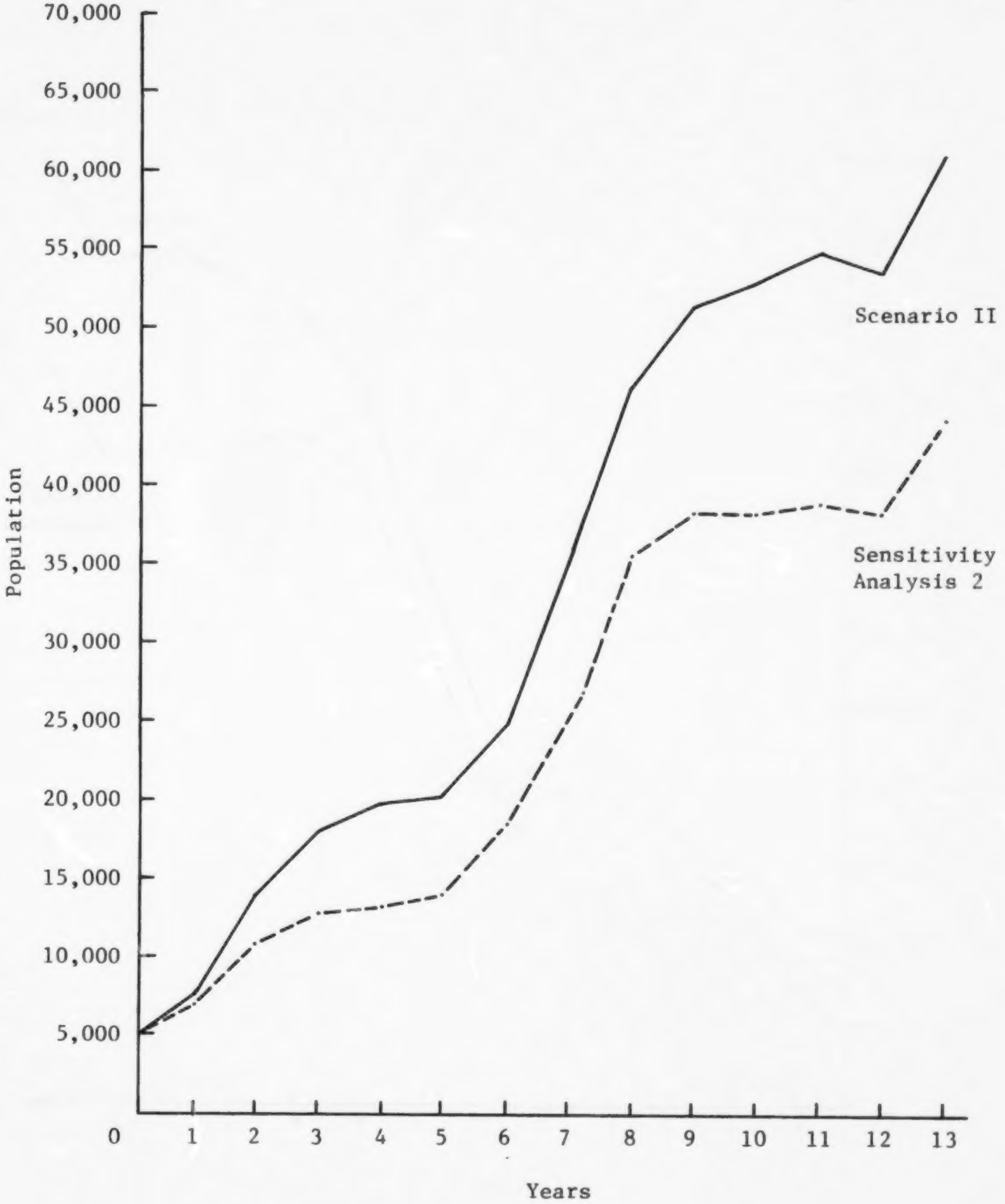
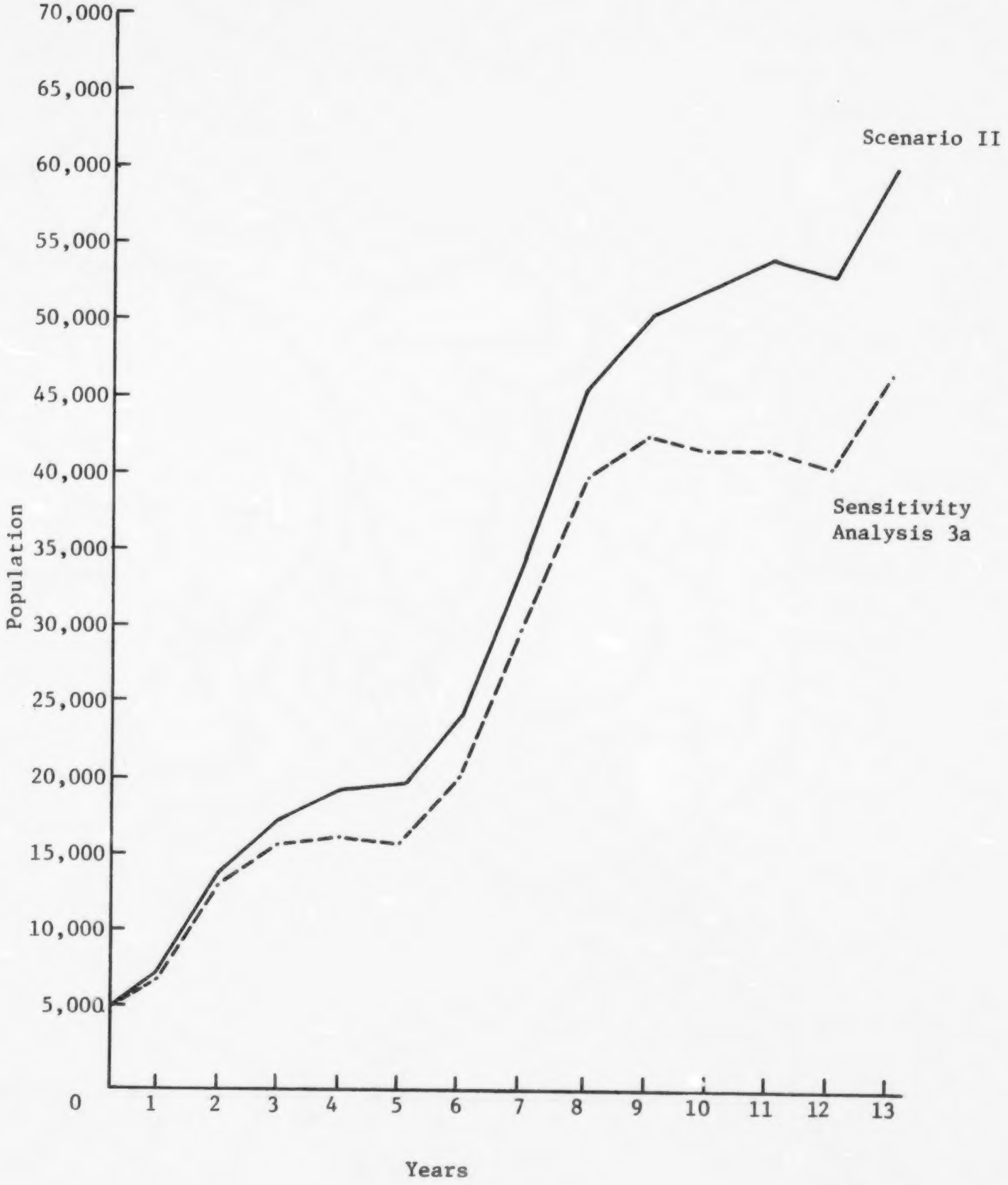


EXHIBIT D-4. TOTAL POPULATION, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs.
Lowering the Multiplier to .5 (Construction and Operating) (S.A. 3a)



change becomes more significant in terms of numbers of people and possible problems associated with growth. (See Exhibit D-5.)

The sensitivity tests done on the lag and accelerator are discussed in more detail in Section C: Indirect Economic Activity. As with employment, the effect that changes in these inputs have on the total population is minimal. This is shown in Exhibits D-6, D-7, and D-8. The total county population is lowered, but probably not enough to be of real significance.

Procedure--income. As explained in Volume II, figures on income were generated to be used in determining the type of housing affordable given certain income limitations* and in assessing the income-related impacts of energy development. An average wage and salary income for the base year for each of the ten employment categories used is needed. Regional Economic Information System (REIS) data were examined, but were not adequate in all cases because the Employment and Personal Income tables did not fully correspond to each other.** Information to supplement the REIS data was obtained from the Colorado Division of Employment and Training. Exhibit D-9 shows the average annual wage and salary income for the northwest Colorado case study area utilizing these two sources. These incomes were adjusted for an annual productivity increase (3 percent) in the model, but no adjustment was made for inflation.

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*For a discussion of how income is used in determining housing demand, see Volume II, Section VIII: Housing.

**The Employment Table has wage and salary employment only and the total Personal Income Table included proprietors and employees. DRI was advised not to use employment numbers to determine an average wage because of the possibility of a severe error especially in Services, Trade, and Finance, Insurance and Real Estate (FIRE) categories.

EXHIBIT D-5. TOTAL POPULATION, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs.
Raising the Multiplier to 1.0 (Construction) and 1.5 (Operating) (S.A. 3b)

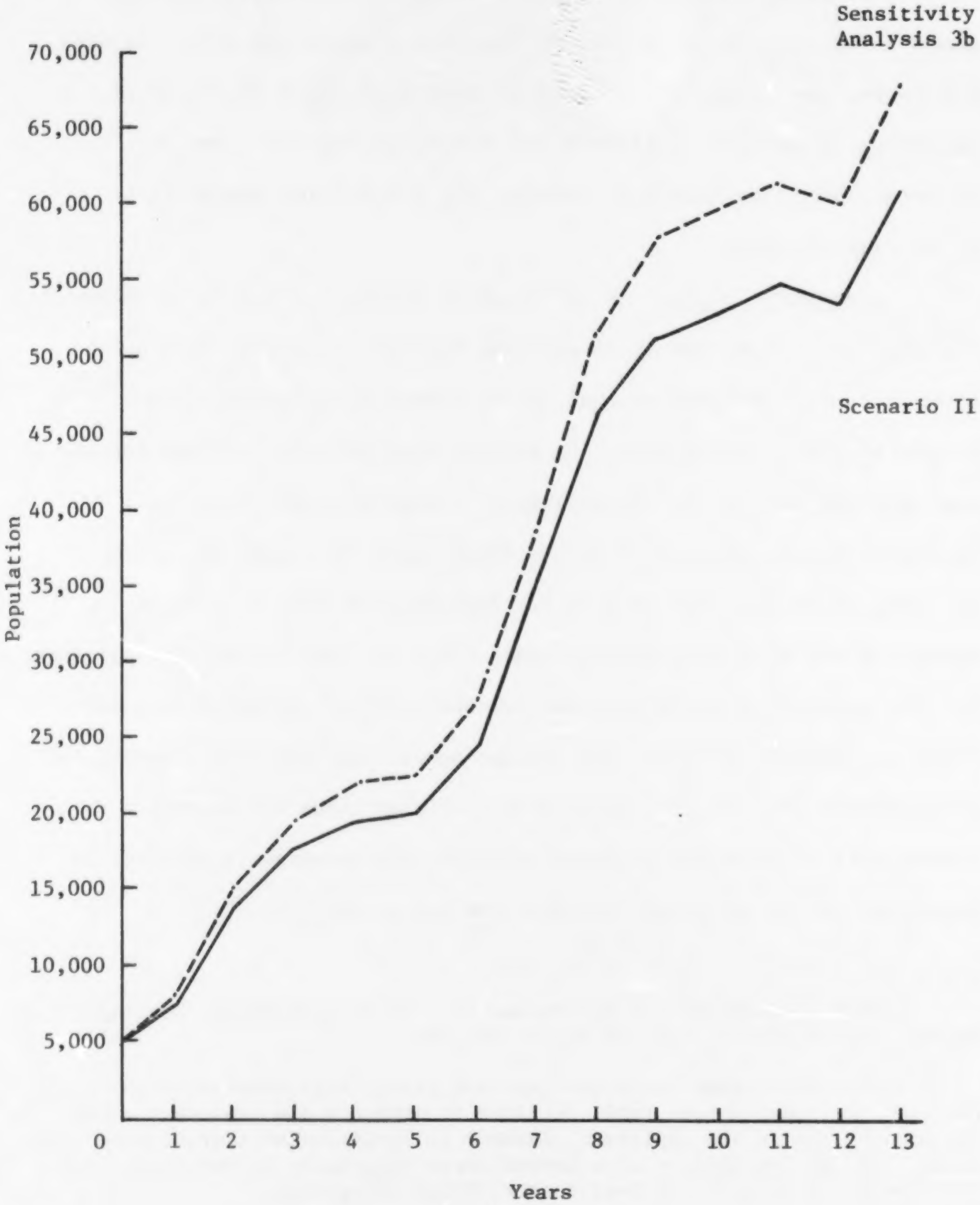


EXHIBIT D-6. TOTAL POPULATION, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Extending the Multiplier Lag from Three to Five Years (S.A. 5a)

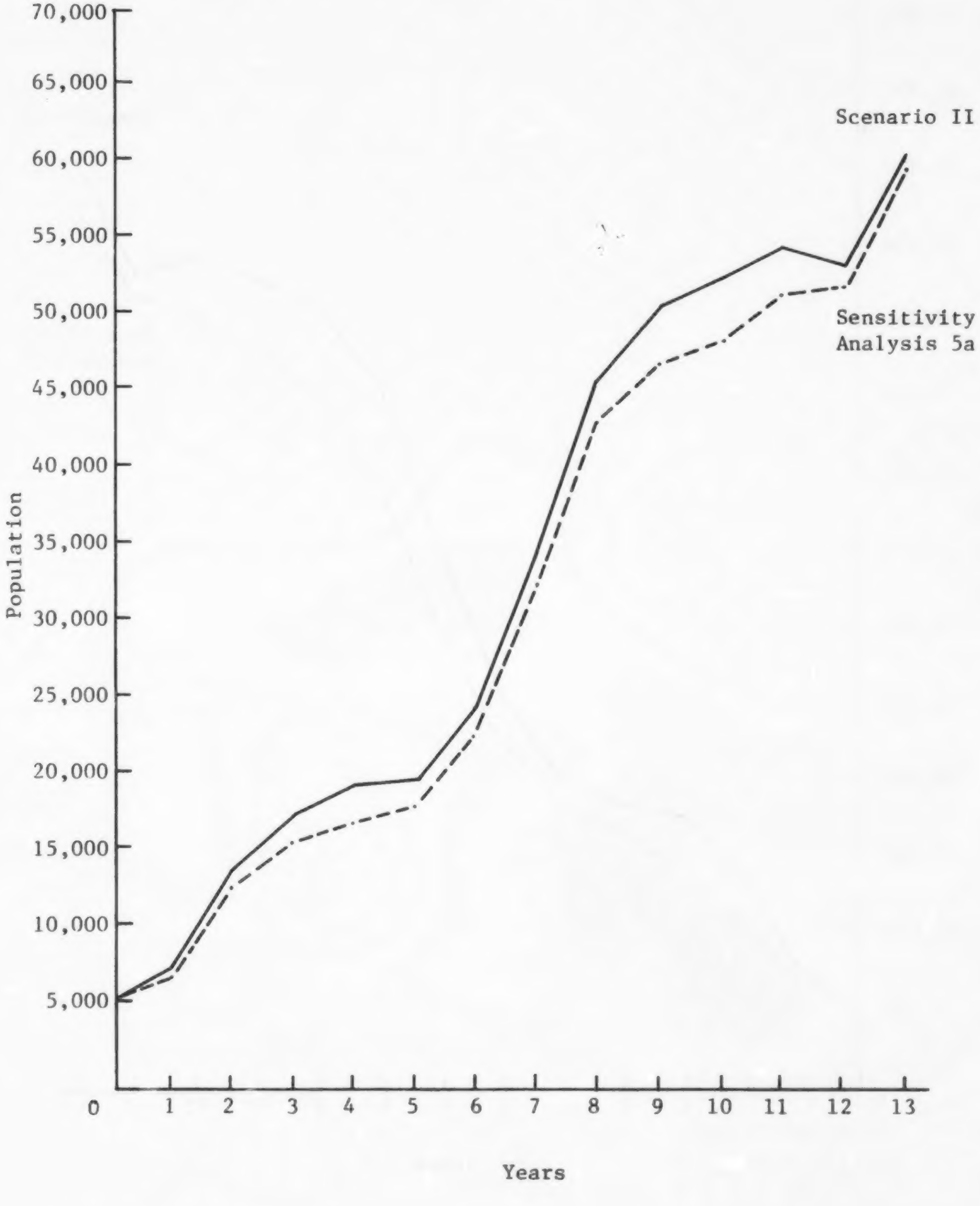


EXHIBIT D-7. TOTAL POPULATION, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Using No Accelerator (S.A. 5b)

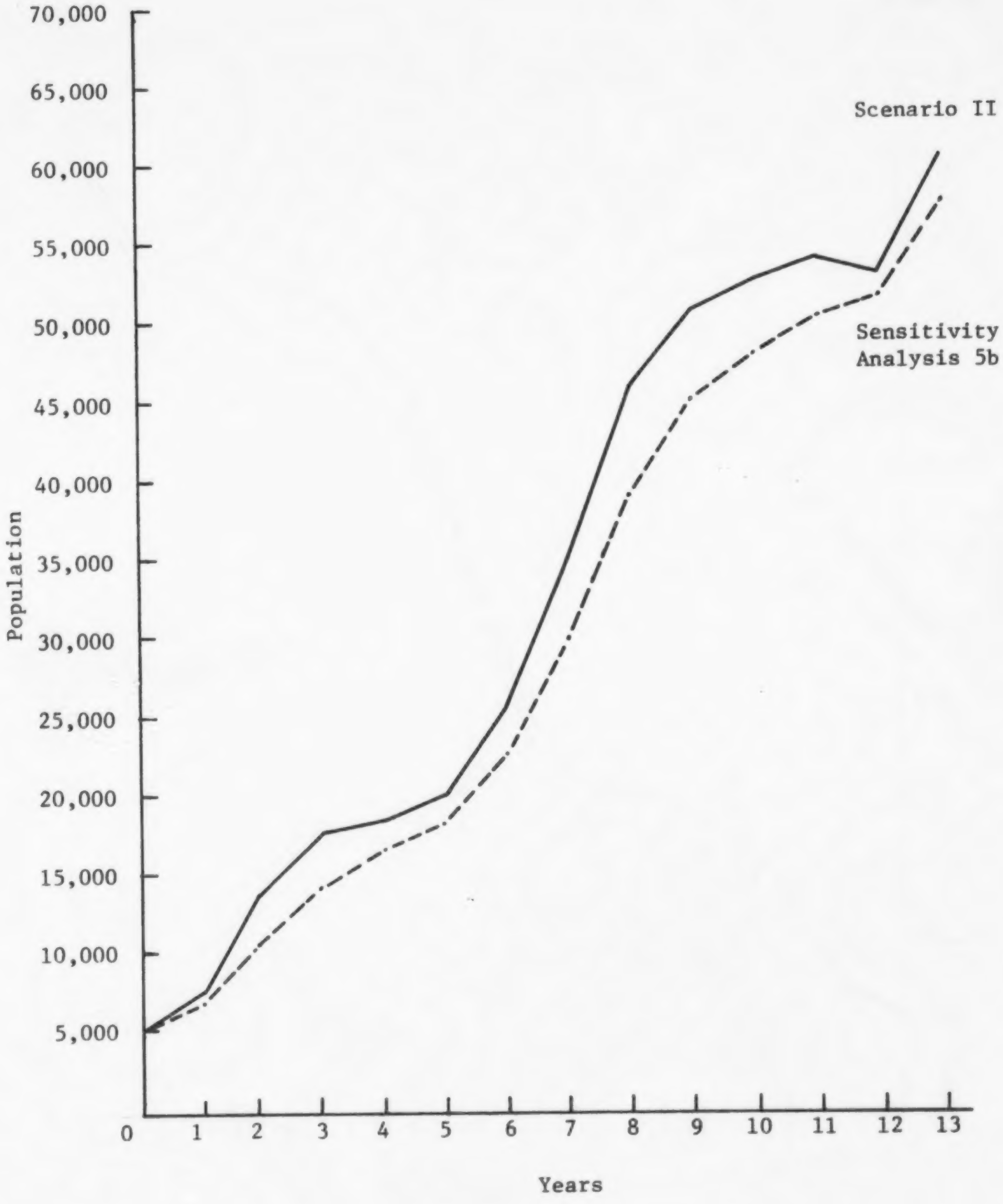


EXHIBIT D-8. TOTAL POPULATION, RIO BLANCO COUNTY

The Results of the Sensitivity Analysis on Scenario II vs. Reducing the Accelerator Requirements (S.A. 5c)

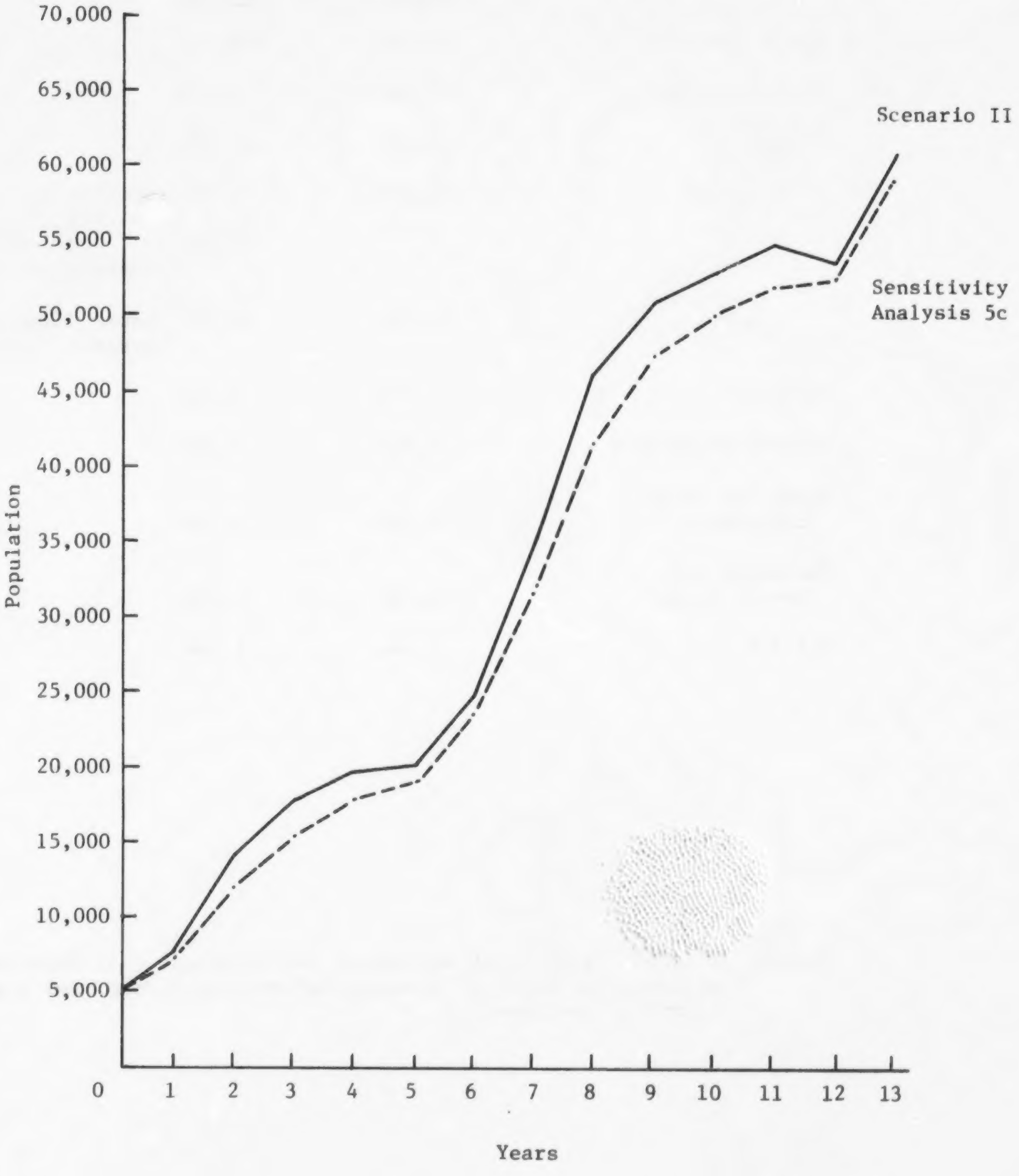


EXHIBIT D-9. AVERAGE ANNUAL INCOME PER EMPLOYEE FOR THE FOUR COUNTY AREA

	Nonbasic Workers	Basic Workers
Agriculture	$10,823	$10,832
Manufacturing	9,744	9,744
Mining	17,880	18,390
Construction	14,376	24,000 (power plant construction workers) 17,801 (all other energy-related construction workers)
T. C. & U.	13,500	18,390 (power plant operating workers)
Services	6,516	6,516
Federal Government	9,984	9,984
State and Local Government	9,984	9,984
Wholesale and Retail Trade	6,708	6,708
F.I.R.E.	9,504	9,504

Source: Colorado Division of Employment and Training, U.S. Department of Commerce, Regional Economic Information System, and statements by energy developers.

In estimating total personal income in Rio Blanco County, REIS data for 1975 were used to determine the relationships between the various components of personal income, for example, proprietor's income, other labor income, and wage and salary income. These relationships were then judgmentally adjusted based on the analyst's previous knowledge of the area. All components of income are in 1977 dollars. An example of the computations and assumptions used in estimating total personal and per capita income for Scenario II is presented below.

Year 2

2.77	Population ratio--population in Year 2 was compared to population in Year 0 (14,139 ÷ 5,100 = 2.77)
X $11,542,700	Total of nonfarm proprietor's income + other labor income + dividends, interest, and rent + transfer payments - personal contributions for social insurance adjusted to 1977 dollars
+ $56,188,000	Wage and salary income for Year 2 from computer printout
+ $17,579,800	The wage and salary component of personal income from the 1975 REIS data, adjusted to 1977 dollars and by an annual productivity factor of 3 percent
+ $4,633,000	The three year average (1973, 1974, 1975) of the farm proprietor's income from 1975 REIS data, held constant throughout the forecast period. This assumes that the increase in farm proprietor's income due to price rises will be offset by the decrease of farm and ranch land in production
= $110,397,200	Estimated total personal income in Rio Blanco County, under Scenario II, Year 2 of the forecast period
÷ 14,139	Population in Rio Blanco County under Scenario II from computer printout
= $7,808	Estimated per capita incomes in Rio Blanco County under Scenario II, Year 2 of the forecast period

Results--income. Exhibit D-10 shows the changes in per capita income for Rio Blanco County under Scenarios I and II, and the base case. Baseline per capita income shows a relatively smooth and gradual increase from $6,449 in Year 1 to $7,493 in Year 13. In comparison, per capita income under Scenarios I and II is more erratic.

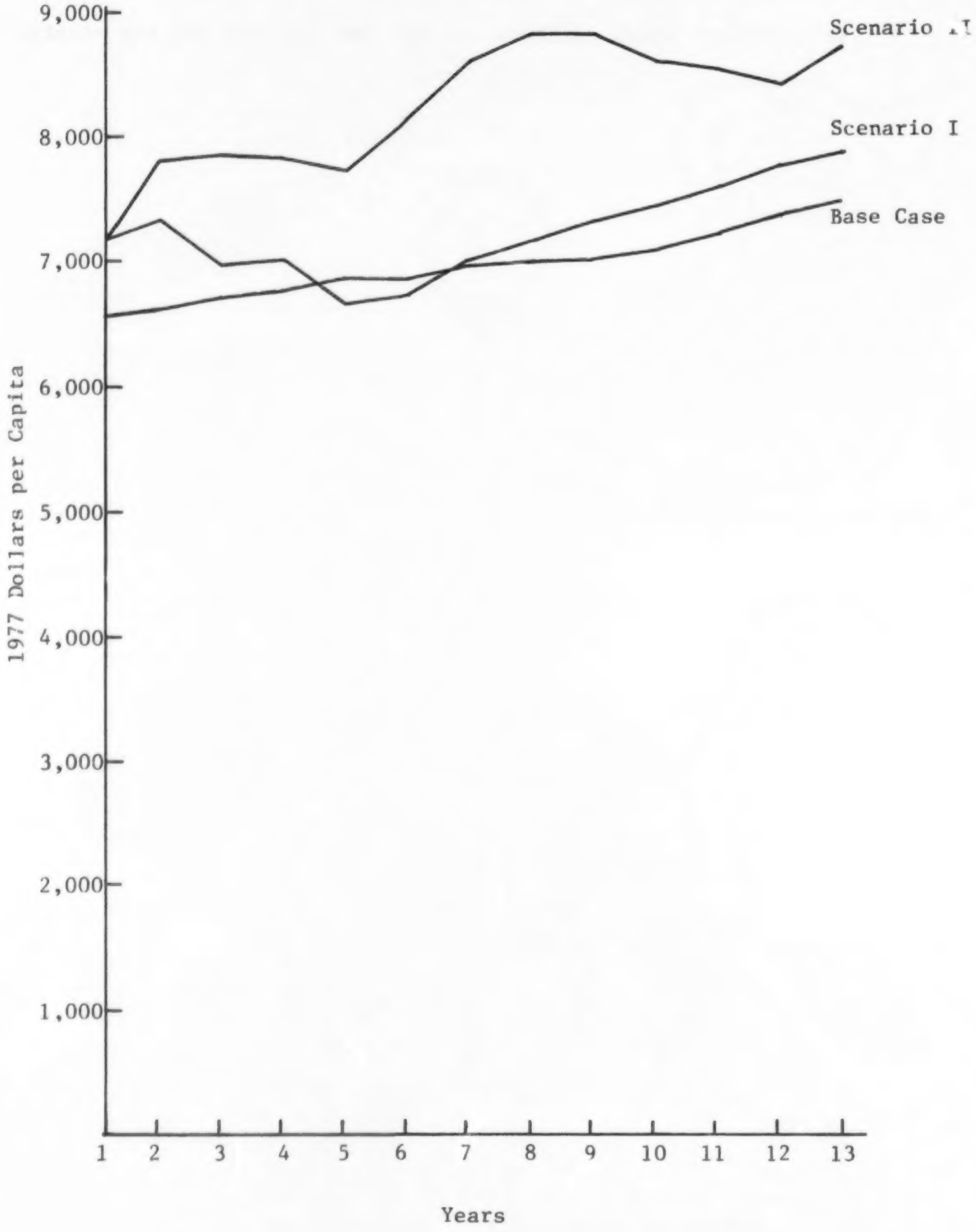
Under Scenario I, Year 1 per capita income is $7,209 which drops off to $6,767 in Year 6, and then begins to increase again. This decline in per capita income occurs about the same time as oil shale development stops, indicating that many of the highest paid employees in the county leave.

Scenario II, with the additional energy development and with commercialization of oil shale, shows a large increase in per capita income (i.e., a relative increase of 21 percent from Year 1 to Year 13). Under this scenario, per capita income is projected to reach its highest level ($8,875) in Year 8. The leveling off of per capita income results from an increasing proportion of local service workers and a reduced number (in the scenario) of construction employees.

Implications. Population estimates are often the basis for planning expansions of community services and facilities. Because of the uncertainties surrounding industry development plans (see Section A: Description of Energy Development), population projections more than two to three years in the future are apt to be rather dubious. Heavy reliance on projections further in the future could cause under or overbuilding of new facilities. Therefore, care must be taken to use any population projections as indications of what may happen in the future given one energy development scenario, not as absolute certainty.

EXHIBIT D-10. PER CAPITA INCOME, RIO BLANCO COUNTY

Results of Scenarios I and II



Income estimates can be important to forecast because they are generally a positive impact. Higher wage levels in a community reflect a greater total disposable income. Among other effects, this is likely to mean more sales tax revenues for the town and for the county.

E. Geographic Distribution of Impacts

As discussed in Volume II, the distribution of employees will be strongly influenced by a number of factors, including: commuting time to the project site, transportation networks, amenities offered in a community, availability of preferred housing, location of trade and service sector jobs, and the communities' disposition toward growth and development. The demonstration methodology requires the analyst to specify likely patterns for (1) settlement by new base case basic employees, (2) settlement by employees from each new basic energy facility, (3) resulting locations of nonbasic employment, and (4) settlement by new nonbasic employees. Distribution assumptions must be made for every area or political jurisdiction for which population estimates and/or public finance analyses are required.

Procedure. The geographic allocations were derived judgmentally based on interviews with local public officials and industry representatives and on the authors' analysis of the location factors mentioned above. As indicated in Exhibit E-1, all new base case basic employees in Moffat, Rio Blanco, and Garfield Counties were assumed to live in the county of their employment. The primary reason for this assumption is the transportation network in northwest Colorado, and the relatively long distances between communities. In most cases, there is only one route between communities, and typically it is a two-lane highway. Distances between the population centers in these four counties are 40 miles or more.

Based on an analysis of net commuting patterns from the 1970 census, it was assumed that a small proportion (3 percent) of the new Mesa County base case employees will live in Garfield County.

EXHIBIT E-1. BASIC-RELATED POPULATION DISTRIBUTION (FRACTION)

Counties of Residence

Counties of Employment	Rio Blanco	Mesa	Garfield	Moffat	Meeker	Meeker School District
Moffat	0.00	0.00	0.00	1.00	0.00	0.00
Garfield	0.00	0.00	1.00	0.00	0.00	0.00
Mesa	0.00	0.97	0.03	0.00	0.00	0.00
Rio Blanco	1.00	0.00	0.00	0.00	0.40	0.55

Of those who work in Rio Blanco County, it has been assumed that 40 percent of the new basic employees will choose to live in Meeker. Most of the remaining 60 percent are assumed to live in Rangely. Meeker is considered to be an attractive community, with better than average public services. However, of all the communities in the case study area, Meeker is perhaps the least anxious for growth to occur. The town is seeking to manage new growth. As a result, new development is likely to be somewhat constrained and perhaps more costly. Using similar reasoning, it is assumed that Meeker School District RE-1, which covers the eastern portion of the county and includes the town, will receive 55 percent of the new residents.

Exhibit E-2 illustrates the settlement assumptions used for new energy-related temporary employees. Where possible, these assumptions were based on the settlement patterns of workers already employed at the development site (determined from interviews with industry officials). The computer model allows for separate input assumptions for temporary and permanent employees on each project. Exhibit E-3 illustrates the settlement assumptions used for new energy-related permanent employees.

Exhibit E-4 illustrates DRI's assumption that some proportion of the nonbasic employment associated with each new basic job in Moffat, Rio Blanco, and Garfield County will occur in the Mesa County (Grand Junction) regional trade center. Regional service industries (e.g.,

EXHIBIT E-2. POPULATION DISTRIBUTION RESULTING FROM TEMPORARY NEW BASIC EMPLOYMENT

LOCATION OF BASIC EMPLOYMENT	RIO B	MES	GAR	MOF	MEEKER	MEEKER S.D.
Parahoe Oil Shale			1.00			
Miscellaneous oil shale (e.g., NOSR)		.20	.80			
Mid Continent Coal						
Anschutz Coal			.90			
CMC Coal		1.0				
Miscellaneous uranium mines						
D&RGW Railroad	.30			.70	1.00	1.00
Colowyo Coal	.30			.70	1.00	1.00
Dravo Coal				1.00		
Colorado-Ute Elec. Assn.				1.00		
Empire Energy Coal				1.00		
Utah International Coal						
Superior Oil Shale	1.00				.66	.66
**Cb Oil Shale	.50		.50		1.00	1.00
Utah Ua & Ub Oil Shale	.70*					
Miscellaneous oil shale (e.g., new leases)	.67		.33		.60	.60
**Ca Oil Shale	1.00				.50	.50
Consolidation Coal	.85			.15	1.00	1.00
Rienau Coal	.90			.10	1.00	1.00
Colorado Ute Power Transmission Line	.70		.30		1.00	1.00

*Assumes road will be built from Rangely to site.
**Assumes road from Rangely to tract will not be built.

EXHIBIT E-3. POPULATION DISTRIBUTION RESULTING FROM PERMANENT NEW BASIC EMPLOYMENT

LOCATION OF BASIC EMPLOYMENT	RIO B	MES	GAR	MOF	MEEKER	MEEKER S.D.
Parahoe Oil Shale			1.00			
Miscellaneous oil shale (e.g., NOSR)		.20	.80			
Mid Continent Coal			1.00			
Anschutz Coal			.90			
CMC Coal		1.00				
Miscellaneous uranium mines		.90				
D&RGW Railroad	.30			.70	1.00	1.00
Colowyo Coal	.50			.50	1.00	1.00
Dravo Coal				.80		
Colorado-Ute Elec. Assn.				.70		
Empire Energy Coal				.70		
Utah International Coal				1.00		
Superior Oil Shale	1.00				.66	.66
**Cb Oil Shale	.50		.50		1.00	1.00
Utah Ua & Ub Oil Shale	.70*					
Miscellaneous oil shale (e.g., new leases)	.67		.33		.60	.60
**Ca Oil Shale	1.00				.50	.50
Consolidation Coal	.85			.15	1.00	1.00
Rienau Coal	.90			.10	1.00	1.00
Colorado Ute Power Transmission Line						

*Assumes road will be built from Rangely to site.
**Assumes road from Rangely to tract will not be built.

EXHIBIT E-4. NONBASIC INCREMENTAL EMPLOYMENT DUE TO BASE CASE BASIC EMPLOYMENT (DISTRIBUTION FRACTIONS)

Counties of Basic Employment	Counties of Nonbasic Employment			
	Rio Blanco	Mesa	Garfield	Moffat
Moffat	0.00	0.05	0.00	0.95
Garfield	0.00	0.15	0.85	0.00
Mesa	0.00	1.00	0.00	0.00
Rio Blanco	0.90	0.07	0.03	0.00

retailing, air facilities, legal) are already well established in Grand Junction, and further growth should follow these established patterns.*

Exhibit E-5 illustrates the assumed settlement patterns of new nonbasic employees, relative to where they work. The assumptions are the same as those in Exhibit E-1 (New Basic Employees, Base Case). With the exception of Mesa County, all new employees are assumed to live in the county of their employment.

Results. Exhibit E-6 illustrates the allocation of regional population growth among the four counties under Scenario I. Exhibit E-7 illustrates the allocation under Scenario II. Scenario II shows that the largest number of new residents will be living in Rio Blanco County.

Sensitivity analysis. If a proposed new road is constructed in Rio Blanco County between the C-a oil shale tract and the Town of Rangely, expectations concerning the geographic distribution of impacts will change considerably. The new road would cut down the commuting distance from Rangely to the C-a tract from 68 miles to 25 miles, thereby diverting the population from Meeker and Rifle to Rangely. The C-a operators (Rio Blanco Oil Shale Company) hope that the road will be built so that growth would be distributed more evenly between Rangely, Rifle, and Meeker.

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*This could change somewhat during the later years of the development period for those scenarios showing the greatest amount of growth in Rio Blanco County. At that point, Rio Blanco County could become a competing center for many regional services.

EXHIBIT E-5. NONBASIC POPULATION DISTRIBUTION (BASE CASE, INCREMENTAL)

Counties of Employment	Counties of Residence: Rio Blanco	Mesa	Garfield	Moffat	Meeker	Meeker School District
Moffat	0.00	0.00	0.00	1.00	0.00	0.00
Garfield	0.00	0.00	1.00	0.00	0.00	0.00
Mesa	0.00	0.97	0.03	0.00	0.00	0.00
Rio Blanco	1.00	0.00	0.00	0.00	0.40	0.55

EXHIBIT E-6. TOTAL POPULATION, BY COUNTY

The Results of Scenario I

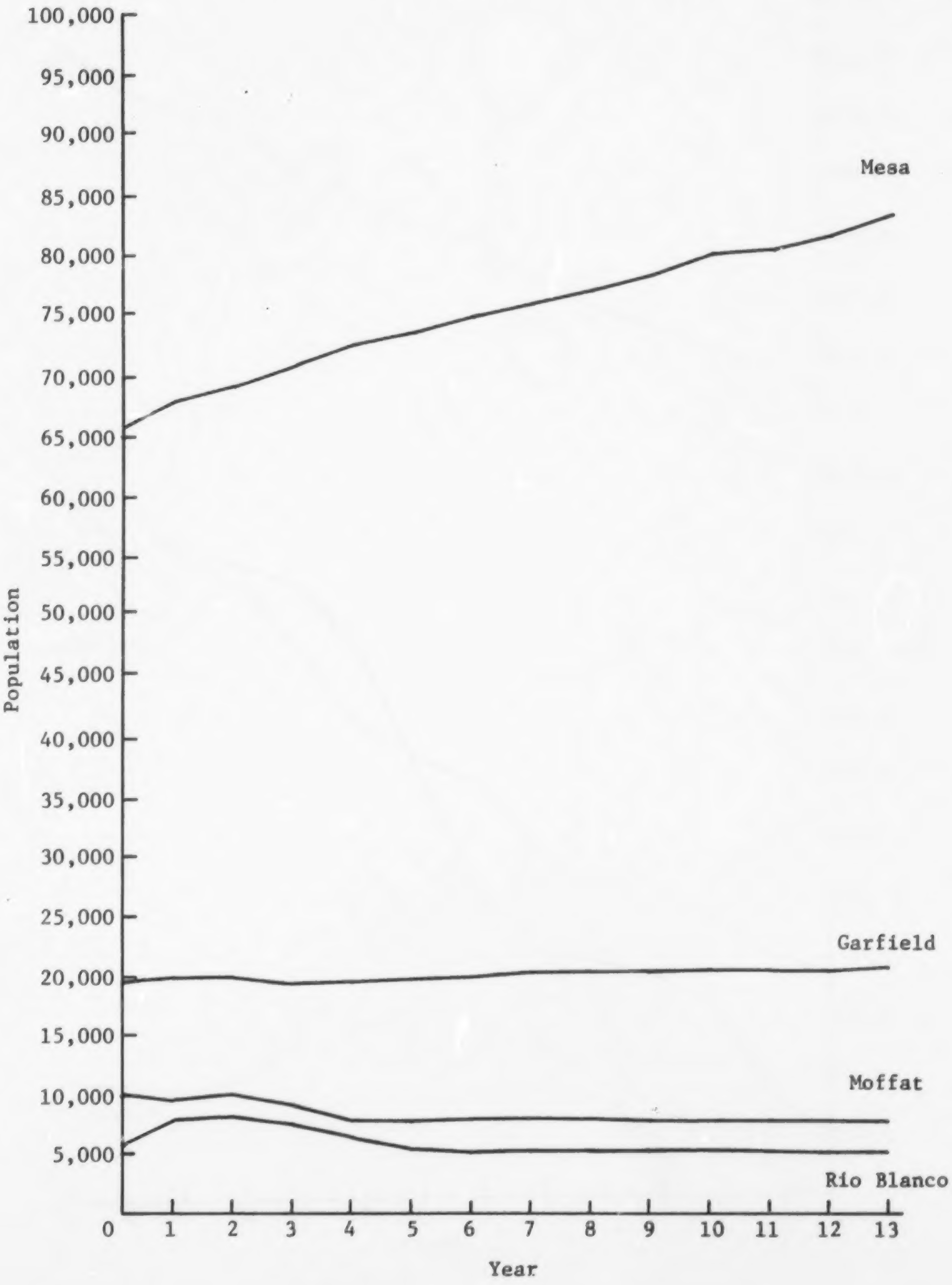
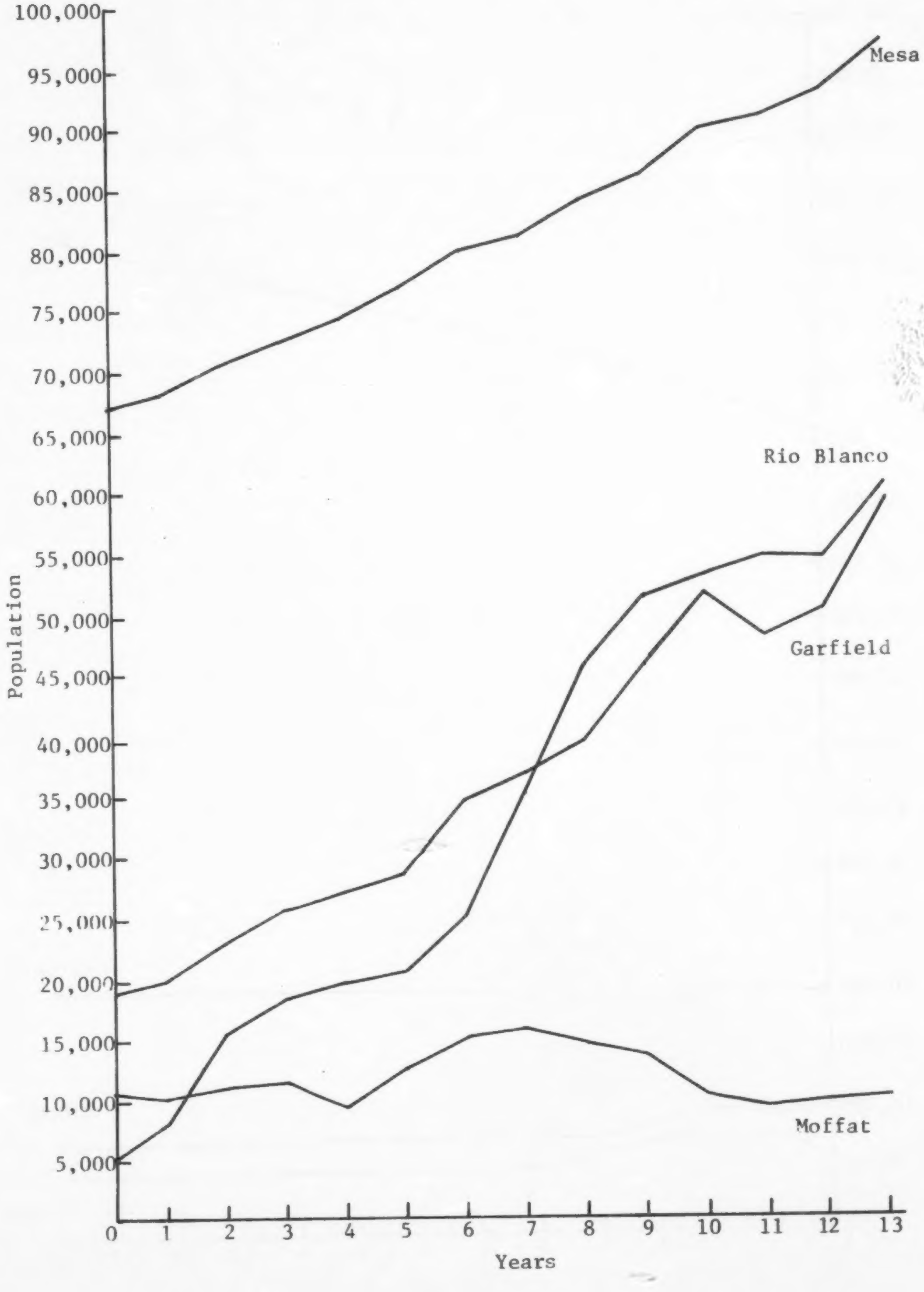


EXHIBIT E-7. TOTAL POPULATION, BY COUNTY

The Results of Scenario II



In addition to the uncertainty concerning this one event (i.e., construction of the Rangely to C-a road), there are other uncertainties in the assumptions. Meeker's attempts to control growth may result in concentration by housing developers and other entrepreneurs on other communities. Other factors, such as credit availability and the level of uncertainty concerning individual oil shale projects, may also have an effect. At present, credit is more readily available in Rifle than in Meeker. This may be partially related to perceptions by financial institutions and developers that some type of growth (whether related to oil shale or coal or even tourism) is more certain to occur in Rifle. As a consequence, some housing and commercial development is now occuring in Rifle without further assurance that any particular oil shale projects will proceed.

An additional computer run (Sensitivity Analysis 2) was made to test the sensitivity of the Meeker population projections to all of these factors. Exhibit E-8 shows the changes in input assumptions used for the sensitivity analysis. Risk and growth controls were assumed to deter nonbasic investments and, therefore, nonbasic employment in Rio Blanco County. (These nonbasic jobs were allocated to Mesa, Garfield, and Moffat Counties instead.) Assuming construction of the Rangely to C-a road, Meeker's share of new residents from Rio Blanco County oil shale projects was also decreased. Exhibit E-9 illustrates the effect of the changes on population projections for Meeker. The projections for new growth are only half as large.

EXHIBIT E-8. CHANGES IN INPUT ASSUMPTIONS FOR SENSITIVITY ANALYSIS 2

Changes in the allocations of nonbasic jobs associated with basic economic activity in Rio Blanco County:

Location of basic jobs	Scenario II	S.A. 2
Rio Blanco	90%	35%
Mesa	7%	25%
Garfield	3%	25%
Moffat	0%	15%

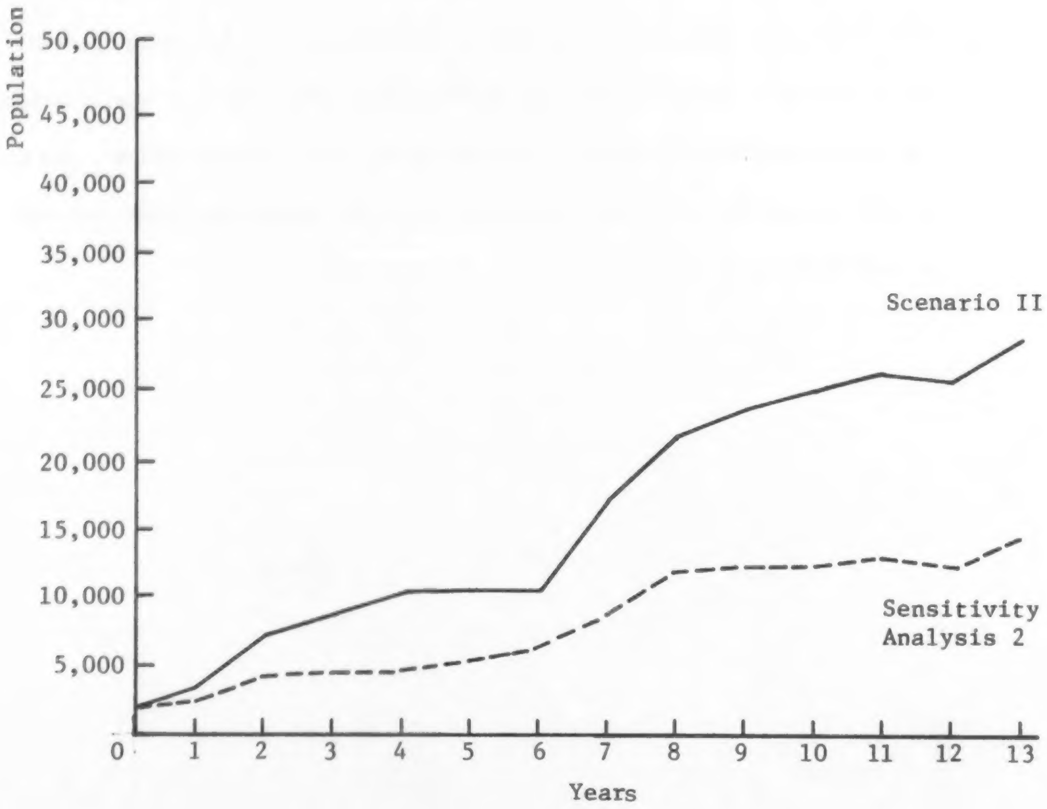
Changes in the residential settlement patterns of new energy-related workers employed in Rio Blanco County:

Energy Project

Jurisdiction of Residence	Scenario II				S.A. 2			
	Superior	Cb	Misc. Oil Shale	Ca	Superior	Cb	Misc. Oil Shale	Ca
Rio Blanco	1.00	.50	.67	1.00	1.00	.20	.67	1.00
Mesa								
Garfield		.50	.33			.80	.33	
Moffat								
Meeker	.66	1.00	.60	.50	.30	.20	.30	.25
Meeker School District	.66	1.00	.60	.50	.30	.20	.30	.25

EXHIBIT E-9. TOTAL POPULATION, TOWN OF MEEKER

The Results of Sensitivity Analysis
on Scenario II vs. Changing Settlement
Patterns (C-a Road Built) to Lower Meeker
Population (S.A. 2)



Implications. Forecasting the geographic distribution of impacts in northwest Colorado remains a very imprecise process. In addition, numerous events may alter projections which would otherwise be correct based on currently available information.

The combination of uncertainty concerning oil shale projects in general, and uncertainty concerning geographic distribution of the impacts of those projects, has stifled most advance building by either the public or the private sector. These implications are discussed further in subsequent sections on public finance, housing, etc.

Since geographic distribution is both difficult to predict and capable of being dramatically altered by policy decisions, this issue may be more effectively treated as a policy issue rather than a forecasting issue. Local public officials and industry leaders may have more success both in determining where growth would cause the least negative impacts, and in using road construction, local growth controls, housing policies, etc. to encourage that pattern of development.

F. Public Finance

Volume II describes the fiscal analysis used in the case studies. A threshold approach was used; capital costs were derived from standardized sources and supplemented by interviews with local officials. Local budgets were used to determine the sources and magnitudes of revenues and operating expenditures according to jurisdiction (Rio Blanco County, Town of Meeker, and Meeker School District).

Rio Blanco County's fiscal condition has become increasingly healthier over recent years primarily due to its ad valorem receipts for oil and gas,* which is its single main source of revenue. As a result, the county mill levy has generally been decreasing: 10.30 (1974), 8.80 (1975), 7.96 (1976), 5.5 (1977), 5.7 (1978), and increasing to 6.58 for 1979, which still makes it one of the lowest in the state. The county is also already receiving its maximum allowable leasehold royalties from oil shale (the state sets a limit of $200,000 per county).

Meeker offers a high level of public services for a community of its size, and, as a result, its level of expenditures is relatively high for a small, western community. Meeker is also already experiencing some increases in operating costs (particulary in higher labor costs) and capital costs (primarily in high land costs) due to energy-related growth pressures.[11] The town has been able to keep its mill levy relatively stable (8.80 in 1977, and 8.15 in 1978 and 1979) because of increasing valuation. Utility charges are the largest source of revenues, followed by property taxes, sales tax receipts, and state and county grants. Sewer and water residential tap fees, $500 and $850 per new tap respectively, provide a continuing source of front-end revenues to the community.*

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*The 1977 value was reported as $153,442,720. Personal communication with Hartley H. Bloomfield, Rio Blanco County Assessor.

There are two school districts in Rio Blanco County, RE 4 in the western part of the county, and RE 1 which includes Meeker in its boundaries. Ad valorem taxes provide over half of the RE 1 School District's total revenues. In order to offset a 20 percent increase in enrollment since 1977, the total ad valorem mill levy is expected to increase from 43.23 mills in 1978 to 48.04 mills in 1979 (this compares to 40.67 mills in 1977 and 42.11 mills in 1976). The District's second largest revenue source is the State Equalization Fund, which makes allocations based on the previous year's enrollment. Although state equalization contributions have been roughly one-quarter of the total from ad valorem taxes, the state formula does not provide for rapid response to sudden growth in enrollment. The school district, like the county, does receive royalty payments from the Mineral Leasing Act of 1920 as well as monies from the Oil Shale Trust Fund. Like the Town of Meeker, the school district is considered to offer high quality services and facilities relative to regional standards. It plans to increase its budget about 20 percent for 1979 in order to maintain this level.

Procedure. The following paragraphs describe steps taken to implement the fiscal assessment process for Rio Blanco County, Meeker and School District RE 1.

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*Although there is a separate Sanitation District, it has been combined with the town's budget for analytical purposes, since the boundaries are largely the same as Meeker's.

Revenue projections. Previous budgets by jurisdiction were examined to determine the principle revenue categories, which are shown on Exhibits F-1, F-2 and F-3. Residential valuation was computed using average prices for four housing prototypes (see Section G: Housing). An assessment rate of 25 percent (based on interviews with county assessors) was applied to derive the following new valuations per unit:

$7,500 per single family unit;
$3,700 per multi-family unit;
$2,500 per mobile home;
$2,500 per "other" unit (e.g., worker barracks).

New residential receipts were estimated based on the number of new units of each housing type forecast as demanded in each jurisdiction. Commercial and industrial valuation was computed on a per capita basis. The 1977 commercial and industrial valuation was divided by the 1977 population to obtain an average per capita rate.

Where appropriate, ad valorem taxation on energy resources was estimated separately for capital investment (in taxable energy facilities) and for the value of production. Interviews with the county and state assessors were conducted to determine valuation techniques and valuation factors currently being applied. This process was particularly difficult with oil shale projects since it is a relatively new technology and there is uncertainty as to the exact procedure (i.e., each county assessor determines his/her own procedures). It was necessary to conduct a second round of interviews with county and state assessors and to involve industry representatives in order to arrive at any convergence of opinions. Where feasible, assessment formulae were also cross-checked with assessed valuations of operations presently underway. The resulting assumptions concerning taxable valuation of new facilities and production are listed in Exhibit F-4.

EXHIBIT F-1. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES*

County of Rio Blanco	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Operating revenues: Ad Valorem Taxes	$1,090,547	NA	New residential assessed valuation at: $7,500 per single family unit $3,700 per multi-family unit $2,500 per mobile home and "other" unit	Assumed confirmation of present construction costs. Rates are based on present averages for new units and on present ratio of residential to commercial & industrial valuation	DRI, based on interview with Bloomfield; and secondary source[15]
Sales Tax	$0	NA	$0	Sales tax can be elected by voters in county. Thus far county has not chosen to do so	DRI, based on interview with Rehborg
Cigarette and Gasoline Tax	$2,500	$.50/Capita	$2,500 + $.60/new resident	New population expected to have higher disposable incomes	DRI, based on budget analysis and analogies with other boom towns

* A list of interviewees is included at the end of this section.

EXHIBIT F-1. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

County of Rio Blanco	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Grants [c]	$41,719	$8/Capita	$35,000/year	Constant amount. Cannot be relied upon to increase. $6,000 in 701 money a one time thing	DRI, based on interview with Rehborg
Fees & Licenses	$145,700	$29/Capita	$29/Capita	Present rate	DRI, based on budget analysis
Royalties	$200,000	NA	$200,000/year	State sets limit to $200,000 per county	DRI, based on interview with Rehborg & Bicker; and secondary source[16]
Hospital User Charges	$356,500	$70/Capita	$70/Capita	Present rate (User rates are based on amount needed to cover hospital operating costs)	DRI, based on interview with McDaniel
Miscellaneous	$80,568	$16/Capita	$16/Capita	Present rate	DRI, based on budget analysis

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[c] Includes CETA ($2,853); 701 ($6,000); state grant county nurses ($3,969); Planning & Land Use ($2,600); public health ($2,897).

EXHIBIT F-1. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

County of Rio Blanco	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Highway Users Tax	**$607,600**	**$119/Capita**	**$119/Capita**	**Same rate basis**	
State Transfers [a]	**$114,996**	**$23/Capita**	**$23/Capita**	**Present rate**	**DRI, based on budget analysis**
Federal Transfers [b]	$62,500	$12/Capita	$22,500/year	Constant amount $40,000 in priority items not anticipated annually	DRI, based on interview with Rehborg
Federal Revenue Sharing	$100,000	$20/Capita	$20/Capita	Same rate basis	

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[a] Includes road and bridge fund ($8,500); social services ($106,496).

[b] Includes forest service ($22,500); priority items ($40,000).

EXHIBIT F-2. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES*d

City of Meeker	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Ad Valorem Tax (Includes $58,424 from sewer district)	$110,254	NA	New residential assessed valuation at: $7,500 per single family unit $3,700 per multi-family unit $2,500 per mobile home and "other" unit	Assumed continuation of present construction costs. Town's non-residential valuation is based on several considerations (see note 1)	DRI, based on interview with Bloomfield; and secondary source[17]
Sales Tax	$55,900	$30/Capita	$55,900 + $32/new county resident	New employees expected to have higher disposable incomes	DRI, based on budget analysis
Cigarette and Gasoline Tax	$10,000	$5/Capita	$10,000 + $5.41/new county resident	Present rate	DRI, based on budget analysis

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[d] Unappropriated Surpluses ($30,000) not included.

*A list of interviewees is included at the end of this section.

EXHIBIT F-2. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

City of Meeker	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Highway Users Tax	$10,800	$6/Capita	$6/Capita	Present rate allocated based on state formula. Factors decreasing local share (size of state receipts, ratio of city to county road mileage) should be offset by factors increasing share (Ratio of city to county population)	DRI, based on state formula; and secondary source.[18]
Utilities Service Charges[e]	$226,738	$123/Capita	$226,700 + $125/new resident	Present rate	DRI, based on budget analysis
Utilities Tap Fees[f]	$36,250	$20/Capita	$500/new sewer tap > residential $850/new water tap > residential Commercial tap fees estimated as 16 percent of residential fees		DRI, based on interviews with Martin & Dunbar

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[e] Includes sewer ($63,113) and water ($163,625); water bond revenues ($33,500) and interest ($2,457) are also included in utilities service charges.

[f] Includes sewer ($5,000) and water ($31,250).

EXHIBIT F-2. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

City of Meeker	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Other User Charges[a]	$39,630	$21/Capita	$21/Capita	Present rate	DRI, based on budget analysis
County Transfers	$22,500	$12/Capita	$12/Capita	Present Rate	DRI, based on budget analysis
State Transfers	$0	NA	NA	NA	NA

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[a] Includes swimming ($5,500); trash ($32,428); land fill ($1,700).

EXHIBIT F-2. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

City of Meeker	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Federal Transfers	$16,500	$9/Capita	$9/Capita	Same rate basis	
Grants[h]	$224,114	$121/Capita	$10,000/year	Existing grant sources cannot be relied on; however, some future revenues appear likely	DRI, based on interview with Young and Dunbar
Fees and License (Includes $1,555 from sewer district--special ownership taxes)	$22,105	$12/Capita	$22,105 + $12/new county resident	Present rate	DRI, based on budget analysis

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[h] Includes Oil Shale Trust ($34,500), Fairfield ($21,697), Department of Transportation systems and roadways grant ($12,000). Also an EPA/state grant to the sewer district ($155,917).

EXHIBIT F-2. ASSUMPTIONS USED IN
ESTIMATING PUBLIC REVENUES (Cont.)

City of Meeker	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Mineral Royalties	$0	NA	NA	No allocations to city	Secondary source[19]
Miscellaneous [1]	$17,813	$10/Capita	$10/Capita	Present rate	DRI, based on budget analysis

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[1] Includes court fines ($4,000); use tax ($7,000); interest ($4,110); library fund ($203).

EXHIBIT F-3.* ASSUMPTIONS USED IN
ESTIMATING PUBLIC REVENUES

School District	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Ad Valorem Taxes	$915,200	NA	New residential assessed valuation at: $7,500 per single family unit $3,700 per multi-family unit $2,500 per mobile home and "other" unit	Assumed continuation of present construction costs. Rates are based on present averages for new units and on present ratio of residential to commercial and industrial valuation	DRI, based on interview with Bloomfield; and secondary source[20]
State Equalization Fund	**$247,894**	**$340/Student**	11.35 per mill per enrollee	**Based on Colorado State equalization formula**	**DRI, based on interview with King; and secondary source[21]**
Other State[j] Transfer Funds	$355,106	**$486/Student**	**$85,106 + $116/new enrollee**	**Present rate. $270,000 from oil shale trust not to be expected annually**	**DRI, based in interview with King**

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[j] **Includes small attendance ($7,500); vo-ed ($18,200); transportation ($59,000); education of the handicapped ($406); building fund ($270,000).**

*A list of interviewees is included at the end of this section.

EXHIBIT F-3. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

School District	Fiscal Year 1977 Total Revenue	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Grants[k]	$25,000	$34/Student	$21,500/year	Present rate, except that Right to Read program will be discontinued	DRI, based on interview with King
PL 81-874	$9,929	$14/Student	$10,000 + $35/new enrollee	Most new enrollees will qualify for PL 81-874 funds	DRI, based on interview with King
Other Federal Funds[l]	$16,571	$23/Student	$16,500/year	Present rate	DRI, based on interview with King
Miscellaneous[m]	$863,813	$1,211/Student	$340/Student	$630,000 for building fund not expected to be a continuing revenue	DRI, based on interview with King
County Sources	$50,000	$68/Student	$68/Student	Assumed to continue at present rate; however although the amount is at discretion of County Commissioners, normally the school district gets 25% of the $200,000 maximum from the Mineral Royalties Fund. (Any amount over $200,000 would go to the school fund as well)	DRI, based on budget analysis; and secondary source[22]

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[k] Includes Title I ($17,500); Title IV ($2,500); Right to Read ($3,500); Spanish Tutorial ($1,500).

[l] Includes general fund ($4,071); food service ($12,500).

[m] Specific ownership ($34.000); other local--general fund ($42,500); building fund ($630,000); pupil activity fund ($70,000); capital reserves funds ($87,000) bond redemption fund ($6,313).

EXHIBIT F-4. ASSUMPTIONS USED IN DETERMINING TAXABLE VALUATION

Energy-Related Activity	Valuation Assumption	Explanatory Remarks
Oil shale--surface retorts		
Facilities	$11.50 for each 1 barrel/day capacity	$55/barrel per day capacity capital investment, 70% of investment is in taxable facilities, 30% assessment rate
Production	$3.50/barrel	$14/barrel value, all taxable at 25% rate
Oil shale--in situ processes		
Facilities	$3.50 for each 1 barrel/day capacity	$27.50/barrel per day capacity capital investment, 35% of which is taxable; 30% assessment rate
Production	$3.50/barrel	Same as above
Coal Mines	$2.25/ton	Assessment method combines production and facilities in taxing "leasehold value"
Power Plants	$150/kilowatt	$500/kilowatt investment; 30% assessment rate
Transmission Lines	$21,740/mile	
Nacholite	$15.38/ton	$51/ton net proceeds; 30% assessment rate
Railroads	$37,844/mile	Average for present track in Moffat County

Sales taxes were applicable only to Meeker, since the county has none.* They were calculated on a per capita basis for 1977, and estimated at $32/capita for future years, because the new incoming employees are expected to have higher disposable incomes.

School foundation taxes were estimated using statutory formulae. The state aid factor is based on the district's assessed valuation. There is a guaranteed tax base per student, and, in the case of the RE 1 School District, it is $11.35 per mill per enrollee.**

Mineral royalties to the county and school district were also estimated using a statutory formula.[12] As mentioned previously, the statutory limit per county is $200,000, which is apportioned at the discretion of the county commissioners. Normally, the school district gets 25 percent of the $200,000.

Most other jurisdictional revenues are estimated as a function of the population (i.e., total receipts divided by population). Future per capita rates were derived by discussing present rates on a line item by line item basis with local officials to determine if the amount is expected to increase, stay at the present rate or be discontinued. Exhibits F-1, F-2, and F-3 summarize revenue inputs for each jurisdiction.

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*Both the county and the municipalities have the option to levy a sales tax. Meeker presently levies a 1 percent tax. The county voters recently defeated a proposed 2 percent county-wide sales tax. If passed, this would have removed the 1 percent City Sales Tax, making the total tax in Meeker (including the 3 percent state tax) 5 percent instead of 4 percent.

**The computations were reviewed first with the Colorado Department of Education and then with the RE 1 School District superintendent.

Operating expenditures projections. Operating expenditures were first divided into categories (three for the school district, seven for the town, eight for the county) which seemed most appropriate (based on past budgets) and manageable in size. As seen on Exhibits F-5, F-6, and F-7, the categories were estimated on per capita rates of expenditures. The sources used initially to derive these rates were past budgets and other secondary sources (see Volume II, Section VII: Public Finance). Local officials were then asked to react to the estimates and refine them if possible.* Wherever possible, local officials were asked to give a specific per capita increase based on the present level and their opinion of anticipated increases. If the officials were still uncertain, ranges for each expenditure were suggested and the officials were asked to give an estimate within the range. Once again, the problem with this approach is its reliance on the judgments of the interviewer and interviewee. In some cases, the confidence level in the interview results was very high, while in others, it was necessary to rely on judgments and knowledge of the area or on previously developed generalized standards.

Capital expenditures projections. A combination of secondary sources and interviews with local officials was used to determine needed facilities and their costs. A population serving threshold approach was used (i.e., population capacities are determined for an existing facility; a new or expanded facility is projected once the population exceeds that capacity).

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*For example, the $28/capita 1977 rate basis for the County Sheriff's Department was adjusted to $32/capita future rate basis after interviewees indicated the need for a larger operating budget because of new growth problems in the county.

EXHIBIT F-5.* ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

County of Rio Blanco	Fiscal Year 1977 Total Expenditure	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
General Administration	$595,108	$117/capita	$595,108 + $110/new resident	Economies of scale possible	DRI, based on analogy with other boom towns
Sheriff	$141,815	$28/capita	$32/capita	Local officials anticipate significant increase in sheriff's budget with new growth problems	DRI, based on interview with Rehborg
Fire	$1,200	$.24/capita	$.50/capita	Fire district contains approximately 60% of the county population.	DRI, based on interview with Lucki
Health, Welfare and Hospitals	$850,779	$167/capita	$850,779 + $175/new resident	Increased welfare, mental health caseloads anticipated as transient job-seekers enter county	DRI, based on interview with Rehborg
Roads and Bridges	$1,007,297	$198/capita	$1,007,297 + $198/new resident	Present rate	DRI, based on budget analysis, and interview with Rehborg
Library and Recreation	$1,200	$.24/capita	$5/resident	Recreation demands likely to increase, likely to be addressed with a special recreation district	DRI, based on interview with Rehborg

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*A list of interviewees is included at the end of this section.

EXHIBIT F-5. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES (Cont.)

County of Rio Blanco	Fiscal Year 1977 Total Expenditure	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Transfer to other Governmental Entities	$50,000	$10/capita	$50,000 per year	Contribution from mineral royalties to school district	DRI, based on interviews with Rehborg and King
Miscellaneous[a]	$234,301	$46/capita	$234,301 + $29/new resident	Contingency fund $83,000 not provided for after this year. Special planning fund also at zero	DRI, based on interview with Rehborg

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[a] Includes county fair ($21,625); airports ($28,669); museum ($12,258); special planning fund ($5,329); veteran's ($1,886); television ($51,056); Extension Service ($30,478); contingency fund ($83,000).

EXHIBIT F-6.* ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

City of Meeker	Fiscal Year 1977 Total Expenditure	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
General Administration[b]	$50,446	$27/capita	$50,450 + $24/new resident	Some economies of scale possible	DRI, based on interview with Young
Police	$55,514	$30/capita	$55.500 + $30/new Meeker resident + $8/new county resident not in Meeker	Level of protection generally regarded as sufficient, even under boom town conditions, however additional demands will occur as a result of developments elsewhere in county	DRI, based on interview with Young and on analogies with other boom town experiences
Fire	$1,850	$1/capita	$6/capita	Full-time fire department	DRI, based on other boom town experiences
Streets (and drainage)	$29,706	$16/capita	$29,706 + $20/new resident	Increases needed for higher maintenance, equipment and personnel costs	DRI, based on interview with Young
Health, Welfare and Recreation[c]	$70,341	$38/capita	$38/capita	Present level	DRI, based on budget analysis and analogies with previous boom towns
Utilities (water - $82.535 sewer - $64,320)	$146,855	$79/capita	$146,900 + $60/new resident	Economies of scale should be possible as system grows	DRI, based on interviews with Young and Dunbar

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[b] Also includes building and zoning ($4,305); judicial ($3,769).

[c] Includes health ($36,218); parks and recreation ($34,123).

*A list of interviewees is included at the end of this section.

EXHIBIT F-6. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES (Cont.)

City of Meeker	Fiscal Year 1977 Total Expenditure	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Miscellaneous[d] ($2,950 - town's contribution to local pension fund)	$36,987	$20/capita	$37,000 + $20/new resident	Present level	DRI, based on budget analysis

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[d] Includes library fund ($25,537); miscellaneous ($500). Also, includes town's contribution to local pension funds ($2,950); other elements of pension funds budget do not involve local outlays and were omitted from this table.

EXHIBIT F-7.* ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

School District	Fiscal Year 1977 Total Expenditure	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source
Instruction	$838,286	$1,148/student	$1,148/enrollee	Present level appears to be appropriate for the Meeker community	DRI, based on interview with King
Transportation	$81,390	$111/student	$81,000 + $100/new enrollee	More concentrated settlements and some economies of scale in transportation system are assumed	DRI, based on budget analysis
Administration and Miscellaneous	$477,891	$655/student	$480,000 + $460/new enrollee	Significant economies of scale possible in school administration	DRI, based on interview with King

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*A list of interviewees is included at the end of this section.

Exhibits F-8, F-9, and F-10 describe the capital budgeting inputs used for each of the three jurisdictions. In some instances, local officials' data were completely substituted for generalized facilities standards and costs. For example, the RE 1 School District superintendent had up-to-date figures on capacity, present capacity utilization, and recent trends in school construction costs. In other instances, officials could not improve on the standards. In general, the further the population serving threshold was from the present population, the more likely was the use of generalized standards.

Results. The computer model projects revenues, operating expenditures, and capital expenditures for 13 years for each jurisdiction. It also combines operating and capital expenditures and compares them with revenues to show a surplus or deficit. Exhibits F-11, F-12, and F-13 compare the results for Scenarios I and II. For Scenario II, which assumes oil shale is successful, Rio Blanco County has a deficit in Year 1 (-$1,722,005) which increasingly worsens. By Year 13, it has a deficit of -$11,774,404. By contrast, the school district's fiscal condition improves dramatically in Scenario II, starting with a surplus of $133,120 in Year 1 which increases to $26,411,089 by Year 13. The Town of Meeker's forecasts fall in between, with a surplus of $249,012 in Year 1 that becomes a deficit in Year 3 which increases to -$3,528,950 by Year 13.

The same trends are seen in Scenario I. Fiscal conditions for the Town of Meeker and Rio Blanco County deteriorate and the school district's improve. However, the changes are on a much smaller scale.

EXHIBIT F-8.* ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES**

County of Rio Blanco	Thresholds	Capital Outlays	Comments/Explanations	Source
Administration	15,000 population	$1,355,400	At capacity now but space would be more than adequate if jail were moved to a separate structure. New courthouse needed at 15,000 population (25,000 square feet at $53.62 per square foot + $14,850 land costs)	DRI, based on interview with Kehborg and Wear: and secondary source[23]
	Beyond 15,000 pop. each increment of 1,000 pop. (16,000; 17,000)	$22,100	585 sq. ft. of bldg/1,000 pop. @ $37.33/sq. ft. + $290 land costs	Secondary source[24]
Sheriff	Now	$2,250,000	New jail needed now, present facility doesn't meet state standards	DRI, based on interview with Brossow
	Additional increments after population reaches 10,000; 14,000	$6,000/vehicle	1 vehicle per 4,000 population	Secondary source[25]
	Beyond 10,000 pop. each increment of 6,000 pop. (10,000, 16,000)	$6,600	150 sq. ft. per 6,000 pop. @ $43.80/sq. ft. + $74 land costs	Secondary source[26]
Fire	Now	$300,000	New fire hall; present fire department volunteer	DRI, based on interview with Lucki
	Now	$45,000	1 ladder truck	DRI, based on interview with Lucki
	12,500 population and each increment of 12,500 thereafter	$75,000	Substation	DRI, based on interview with Lucki

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*A list of interviewees is included at the end of this section.

**Capital expenditures less than $3,000 included in operating. These represent furniture, small equipment, etc.

EXHIBIT F-8. ASSUMPTIONS USED IN ESTIMATING
PUBLIC CAPITAL EXPENDITURES (Cont.)

County of Rio Blanco	Thresholds	Capital Outlays	Comments/Explanations	Source
Fire (cont.)	Additional increments after population reaches 10,000 (10,000, 20,000, 30,000)	\$50,000/vehicle \$6,000/vehicle \$40,000/vehicle	2 pumpers per 10,000 population 1 staff car per 10,000 population 1 ambulance per 10,000 population	Secondary source[27]
Health, Welfare and Hospital	5,000 population	\$6,000,000	Total renovation or replacement of existing facilities (estimated needs are for 40 bed hospital; 120 bed nursing home and physician center; probably in Meeker)	DRI, based on interview with McDaniel
	8,000 population	\$1,000,000	Expansion of Rangely Hospital (would add an additional 20 beds)	DRI, based on with Garland
	Additional increments beyond 11,000 population (11,000, 12,000, 13,000)	\$42,500	4 beds per 1,000 population	Secondary source[28]
Roads and Bridges	Now	\$250,000	Improvements to hot mix plant	DRI, based on interview with Rehborg
	6,000	\$1,000,000	Resurfacing of county road 24	DRI, based on interview with Rehborg
	Now	\$14,000,000	Road needed from Ca tract to Rangely	DRI, based on interview with Rehborg
	Additional increments beyond 11,600 population	\$100,000/mile	4 miles of arterial roads per 6,500 new residents	DRI, based on regional standards
Library and Recreation[a]	At 6,000 pop. and each 6,000 pop. increment thereafter	\$41,000	Community Park	DRI, based on regional standards

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[a] A library special district has recently been formed and there are preliminary plans to form a recreation district.

EXHIBIT F-8. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

County of Rio Blanco	Thresholds	Capital Outlays	Comments/Explanations	Source
Library and Recreation[b] (cont.)	At 8,000 pop. and each 8,000 pop. increment thereafter	$79,100	Ballfield ($28,700), tennis courts ($13,400), playgrounds ($37,100)	DRI, based on regional standards
	Additional increments/2,000 pop. after 10,000 pop. (10,000, 12,000, 14,000)	$10,000/park	Neighborhood parks	DRI, based on regional standards
	At 25,000 pop. and each 25,000 pop. increment thereafter	$21,200	Ice skating rink (1/25,000 pop.; 1,600 sq. ft.; 0.5 acres; $33.21/sq. ft. + $686 land costs)	Secondary source[29]
	At 25,000 pop. and each 25,000 pop. increment thereafter	$152,600	Swimming pool (42' x 82'/25,000 pop. @ $35.31/sq. ft. + $800 land costs)	Secondary source[30]
	Beyond 8,000 pop. each 1,000 pop. increment (8,000, 9,000, 10,000)	$97,100	1,000 sq. ft./1,000 pop. @ $48.74/sq. ft. and 3,000 books per 1,000 pop. @ $16/volume + $405 land costs	Secondary sources[31]

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[b] A library special district has recently been formed and there are preliminary plans to form a recreation district.

EXHIBIT F-9.* ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES**

City of Meeker	Thresholds	Capital Outlays	Comments/Explanations	Source
Administration	Now	See police, below	Overcrowded now (would be just adequate if police were moved to a separate structure)	DRI, based on interview with Martin
	10,000 population	$189,000	5,000 sq. ft. administrative space and parking	DRI, based on interview with Young
	Additional increments beyond 10,000 population (10,000, 11,000, 12,000)	$11,800 per additional 1,000 population	300 sq. ft. per 1,000 population $38.72/sq. ft. + $178 land costs	DRI, based on secondary sources[32]
Police	Now	$231,000	6,000 sq. ft. police facility and parking	DRI, based on interview with Young
	Additional increments beyond 10,000 population (10,000, 11,000, 12,000)	$15,700 per additional 1,000 population	340 sq. ft. per 1,000 population $45.44/sq. ft. + $202 land costs	Secondary source[33]
	Additional increments beyond 2,000 population (5,300; 8,600; etc.)	$6,000/vehicle	1 vehicle per 3,300 population	Secondary source[34]
Fire	6,000 population	$50,000	New fire station	Based on interview with Young
	Additional increments beyond 6,000 pop. (16,000, 26,000, 36,000)	$109,200	1 station/10,000 pop. @ 3,000 sq. ft. @ $35.92/sq. ft. + $1,485 land costs	Secondary source[35]
	Additional increments beyond 2,000 population (12,000; 22,000; etc.)	$50,000/vehicle $6,000/vehicle $40,000/vehicle	2 pumpers per 10,000 population; 1 staff car per 10,000 population; 1 ambulance per 10,000 population	Secondary source[36]

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*A list of interviewees is included at the end of this section.

**Capital expenditures less than $3,000 included in operating. These represent furniture, small equipment, etc.

EXHIBIT F-9. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

City of Meeker	Thresholds	Capital Outlays	Comments/Explanations	Source
Streets (and drainage)	Now	$1,500,000	Drainage project	DRI, based on interview with Young
	Now	$300,000	Street overlay	DRI, based on interview with Young
	4,000 population	$2,926,000	7.6 miles of secondary roads @ $385,000/mile	Allen Voorhees and Associates
	Additional increments per 1,000 population (after 4,000) (5,000, 6,000, 7,000)	$2,425,000	6.3 miles of secondary roads/ 1,000 population @ $385,000/mile	Allen Voorhees and Associates
Health, Welfare and Recreation	Now	$520,000	Construction/improvements on aquatic center ($350,000); recreation center ($150,000); tennis courts ($20,000)	DRI, based on interview with Young
	Beyond 3,000 pop. in increments of 1,000 pop. (3,000, 4,000, 5,000)	$29,400	Neighborhood parks: 2 acres per 1,000 pop. @ $8,178/acre + $3,200 land costs. Play field: 1.5 acres per 1,000 pop. @ $4,950 per acre + $2,400 land costs	DRI, based on secondary sources[37]
	Beyond 3,000 pop. in increments of 3,000 pop. (3,000, 6,000, 9,000)	$42,000	Softball field: 1 field/3,000 pop. @ $28,675 per field. Tennis courts: 1 court/3,000 pop. @ 0.23 acres per court @ $13,000 per court + $368 land costs	DRI, based on secondary sources[38]
	Beyond 8,000 pop. in increments of 5,000 pop. (8,000, 13,000, 18,000)	$78,100	Community park: 3.6 acres per 5,000 @ $9,784/acre + $5,760 land costs. Playground: 1.5 acres/5,000 pop. @ $23,134 per acre + $2,400 land costs	DRI, based on secondary sources[39]

EXHIBIT F-9. ASSUMPTIONS USED IN ESTIMATING
PUBLIC CAPITAL EXPENDITURES (Cont.)

City of Meeker	Thresholds	Capital Outlays	Comments/Explanations	Source
Utilities[a]	4,000 population	$250,000	Expansion of water system	DRI, based on interview with Young
	8,000 population	$300,000	Expansion of water system that would have a population serving capacity of 12,000	DRI, based on interview with Young
	12,000 pop. and each 10,000 pop. increment thereafter	$5,851,500	Increase entire water supply system to an additional 10,000 capacity	Secondary source[40]
	Now	$2,100,000	Replacement of sewer line	DRI, based on interview with Dunbar
	4,000 population	$3,818,000	Expansion of sewer system (would have population serving capacity of 12,000)	DRI, based on interviews with Wright-McLaughlin and McDonnell-Smith
	12,000 pop. and each 10,000 pop. increment thereafter	$2,702,700	Increase entire sewerage system to an additional 10,000 capacity	Secondary source[41]
Miscellaneous	NA	NA	NA	NA

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[a] Includes Meeker sewer services, which are provided by a sanitation district rather than the town. $2.1 million is needed now to replace one of main lines to the plant. Present capacity of plant is 4,000 population and it is currently operating at 65% capacity. Federal money will not be released until mid-1979, at which time plant expansion is anticipated. This would increase the population-serving capacity to 12,000.

EXHIBIT F-10.* ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES**

Schools	Thresholds	Capital Outlays	Comments/Explanations	Source
Schools	Now	$12,000	Maintain old jr. high in usable condition	DRI, based on interview with King
	Beyond 1,240 enrollment--additional increments (1,240, 1,640)	Beyond 1,240 students: $2,023,800 for each increment of 400 students	Expansion of school facilities for each 400 new enrollees based on 100 sq. ft./new student @ $50/sq. ft. + $23,760 land costs	DRI, based on interview with King, and secondary source[42]
Administration	Beyond 2,190 enrollment--additional increments (2,190, 2,290)	Beyond 2,190 students: $27,100 for each increment of 1,000 students	Expansion of administration facilities for each 5 new administrative employees/1,000 new students based on 150 sq. ft./new employee @ $35.55/sq. ft. + $446 land costs	DRI, based on interview with King, and secondary source[43]

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*A list of interviewees is included at the end of this section.

**Capital expenditures less than $3,000 included in operating. These represent furniture, small equipment, etc.

EXHIBIT F-11. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, RIO BLANCO COUNTY

The Results of Scenario I and II

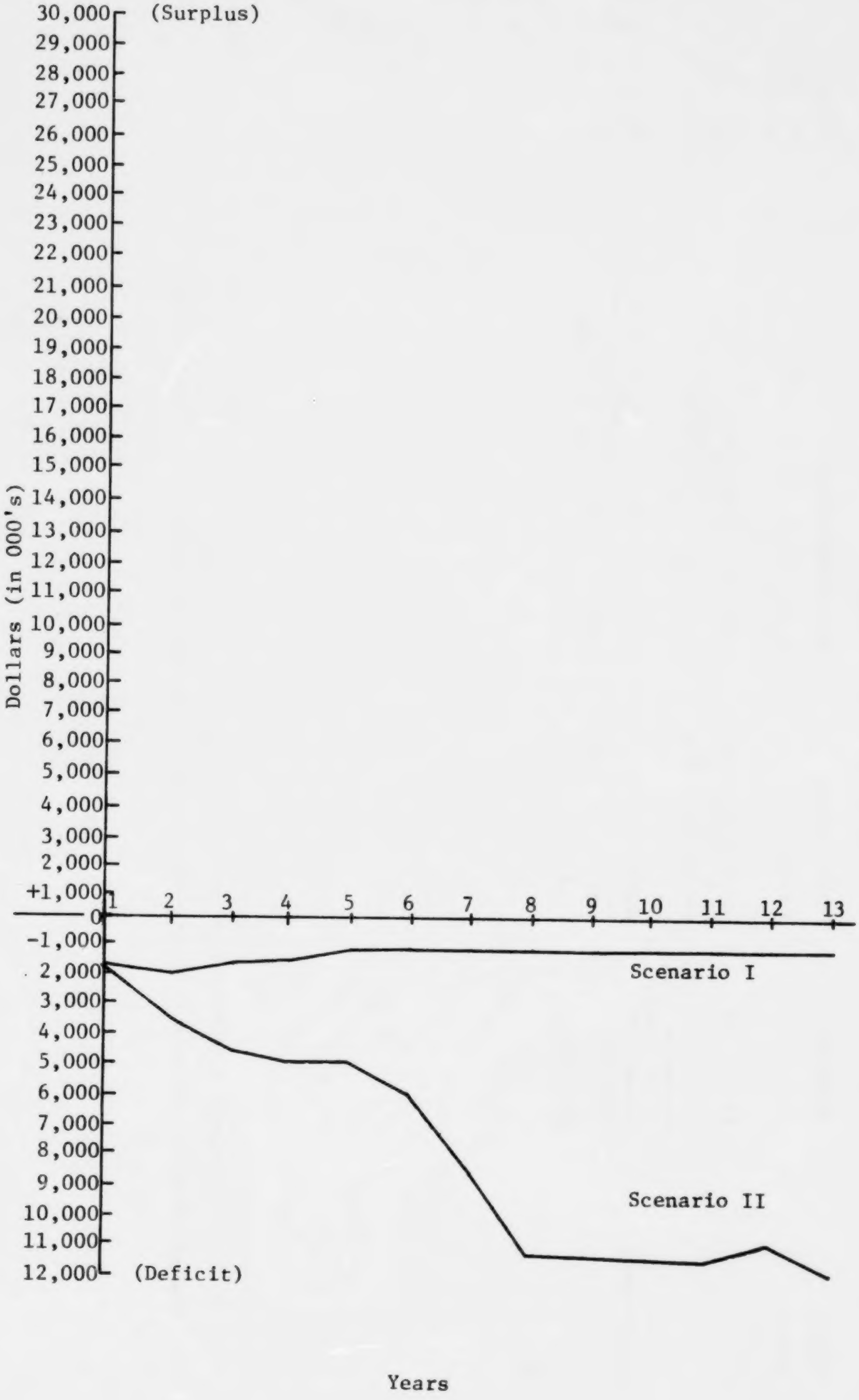


EXHIBIT F-12. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, TOWN OF MEEKER

The Results of Scenario I and II

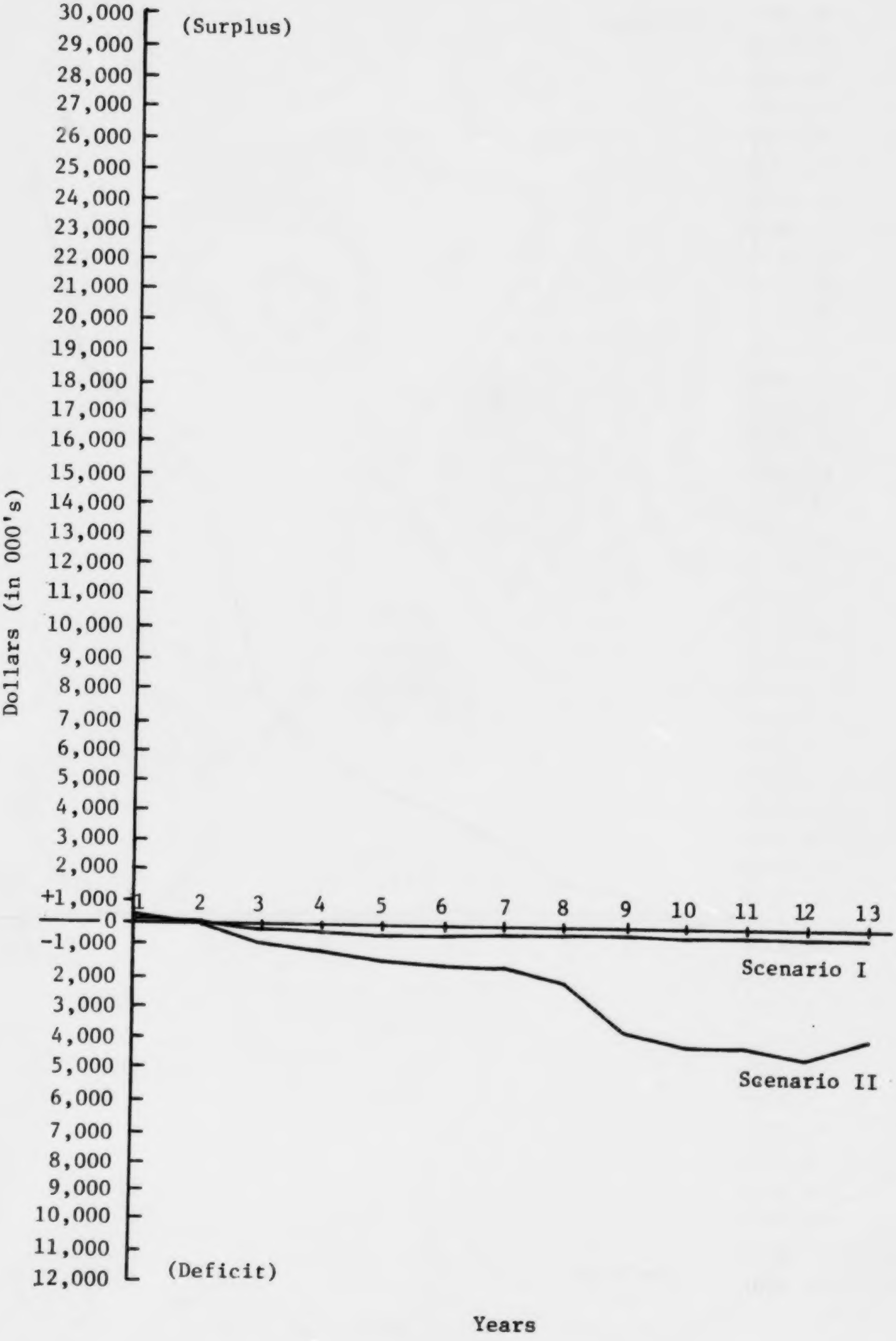
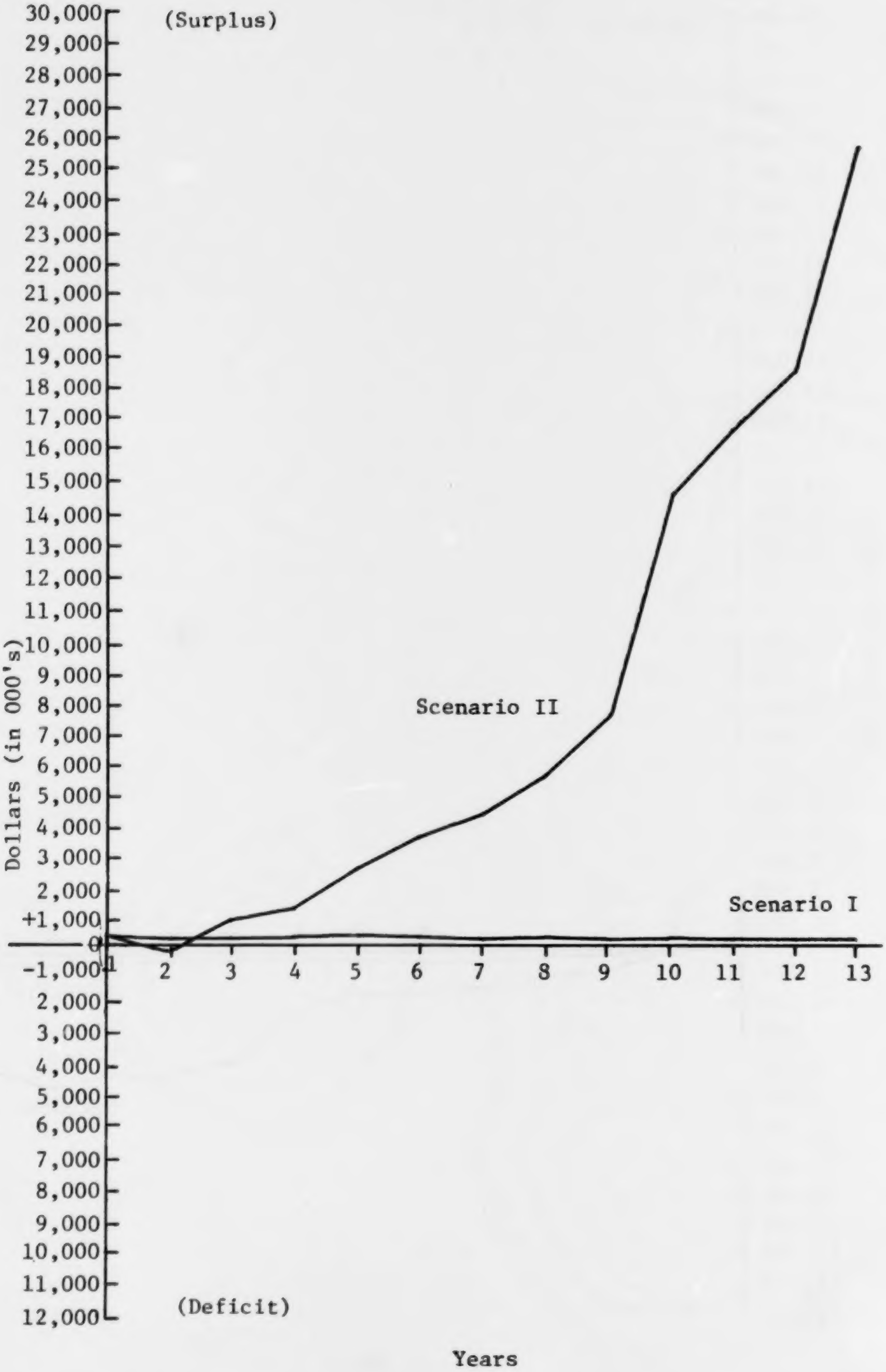


EXHIBIT F-13. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, RE 1 SCHOOL DISTRICT

The Results of Scenario I and II



The forecast of a net negative fiscal impact in Rio Blanco County is inconsistent with the results of previous studies.[13] This is not due to differences in methodological approaches. It is the result of a combination of events, both external and internal to the oil shale industry, which have occurred in the interim:

- The County's oil and gas revenues have risen phenomenally since these previous studies as a consequence of new recovery techniques and higher prices. Since oil and gas employment has remained virtually unchanged, this represents something of a "windfall profit" to the County. Addition of further energy-related employment will dilute the effects of these oil and gas surpluses, spreading them over a larger county budget.
- In response to increases in oil and gas receipts, the County has lowered its ad valorem mill levy. As a consequence, further energy development will be taxed at a lower rate.
- Most oil shale projects have shifted from surface retorts to modified in situ technologies. As indicated previously, in situ facilities only provide roughly 25 percent as much taxable valuation per barrel of output as surface retorts.

Sensitivity analysis. Two types of sensitivity analyses were conducted, one to take into account uncertainties that may exist within the estimating procedures and another to address effects of uncertainties that exist elsewhere in the system (e.g., the impacts which settlement patterns have on public finance).

Sensitivity to estimating technique. A more common approach to public expenditures is to rely solely on generalized per capita standards for both operating costs and capital facilities. Sensitivity Analysis 4 was conducted to compare the results with the more standard technique. Inputs for the sensitivity run were based on generalized cost standards developed for this project by Socioeconomic Research Associates.[14] Exhibit F-14 lists these inputs.

In the sensitivity forecasts, by Year 13 Rio Blanco County's deficit is roughly one-half of that projected in Scenario II (-$5,294,396 vs. -$11,774,404). Meeker's fiscal condition is also improved (-$2,224,039 by Year 13 vs. -$3,528,950). The net result for the school district is less dramatic. The sensitivity analysis increases the district's surplus marginally throughout, and by Year 13 there is an additional $254,064 (out of approximately $26 million). Exhibits F-15, F-16, and F-17 compare Scenario II with Sensitivity Analysis 4 in the three jurisdictions. For jurisdictions which are experiencing adverse impacts, the use of the demonstration methodology (with population thresholds determining when large new facilities must come on-line) appears to result in much larger forecasts of deficits than does the more typical per capita approach.

Sensitivity to other uncertainties. The second type of sensitivity analysis, the effects of exogenous variables on public finance, can be illustrated by looking at the impacts of settlement patterns. Specifically, Meeker's population is lowered due to the road built from Rangely to the C-a tract. Comparing this with Scenario II, the most dramatic effect is that Rio Blanco County's deficit is reduced approximately $3.5 million by Year 13. Meeker's deficit is also lessened by Year 13 when settlement patterns are altered (from -$3,528,950 to -$1,765,115). The school district's surplus increases $3.7 million by the final year. See Exhibits F-18, F-19, and F-20 for a comparison of the Sensitivity Analysis 2 with Scenario II.

EXHIBIT F-14. SENSITIVITY ANALYSIS 4
ASSUMPTIONS ON COST STANDARDS FOR PUBLIC SERVICES AND FACILITIES

	1977 Dollars Operating Costs		
	Rio Blanco $/Capita	Meeker $/Capita	School District $/Capita
Schools			398
Administration	28	28	
Sheriff/Police	50	11	
Fire	14	14	
Health, Welfare & Hospitals	201		
Road & Bridges	48		
Streets & Drainage		48	
Library & Recreation	18	69(Health, Welfare & Recreation)*	
Utilities		47	
Miscellaneous	31	31	
Governmental Transfers	$50,000/yr		
	1977 Dollars Capital Costs		
Schools			1,888
Administration	133	133	
Sheriff/Police	11	11	
Fire	54	54	
Health, Welfare & Hospital	153		
Roads & Bridges	616		
Streets & Drainage		1,442	
Library & Recreation	189	136(Health, Welfare & Recreation)**	
Utilities		606	

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*If Meeker Health, Welfare, and Recreation has been divided into Health and Welfare and into Recreation:

Health and Welfare	$59
Recreation	$10

**If Meeker Health, Welfare and Recreation has been divided into Health and Welfare and into Recreation:

Health and Welfare	$0
Recreation	$136

NOTE: Revenues remain the same as in original Scenario II.

Source: Socioeconomic Research Associates, Socioeconomic Impacts of Western Energy Development (Boulder, Colorado: August 1976), Working Paper #1, prepared for the Council on Environmental Quality. These standards were derived by comparing a number of other secondary sources (see reference 14).

EXHIBIT F-15. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, RIO BLANCO COUNTY

The Results of Sensitivity Analysis on Scenario II vs.
Costs Based on Other Studies (S.A. 4)

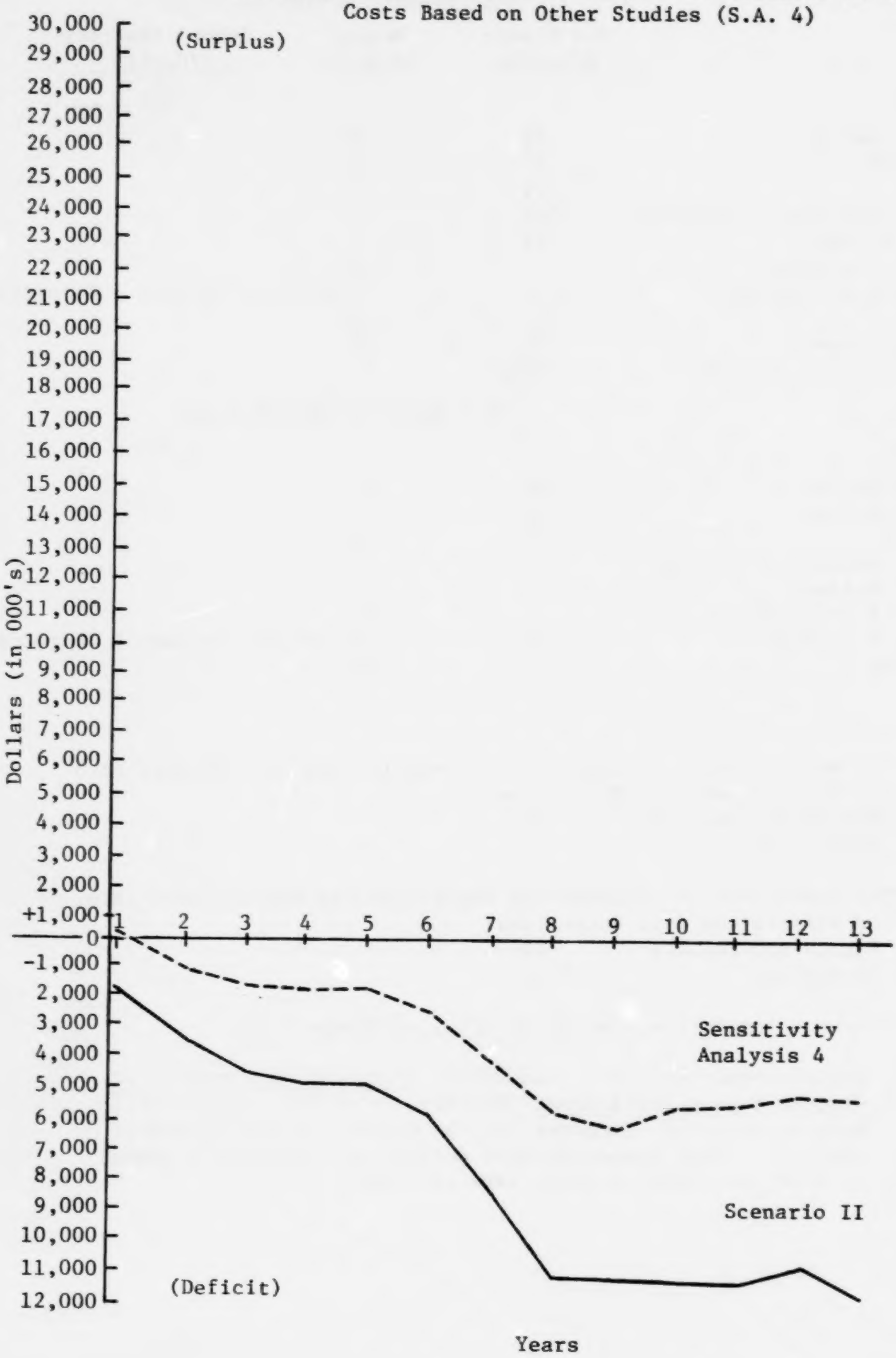


EXHIBIT F-16. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, TOWN OF MEEKER

The Results of Sensitivity Analysis on Scenario II vs. Costs Based on Other Studies (S.A. 4)

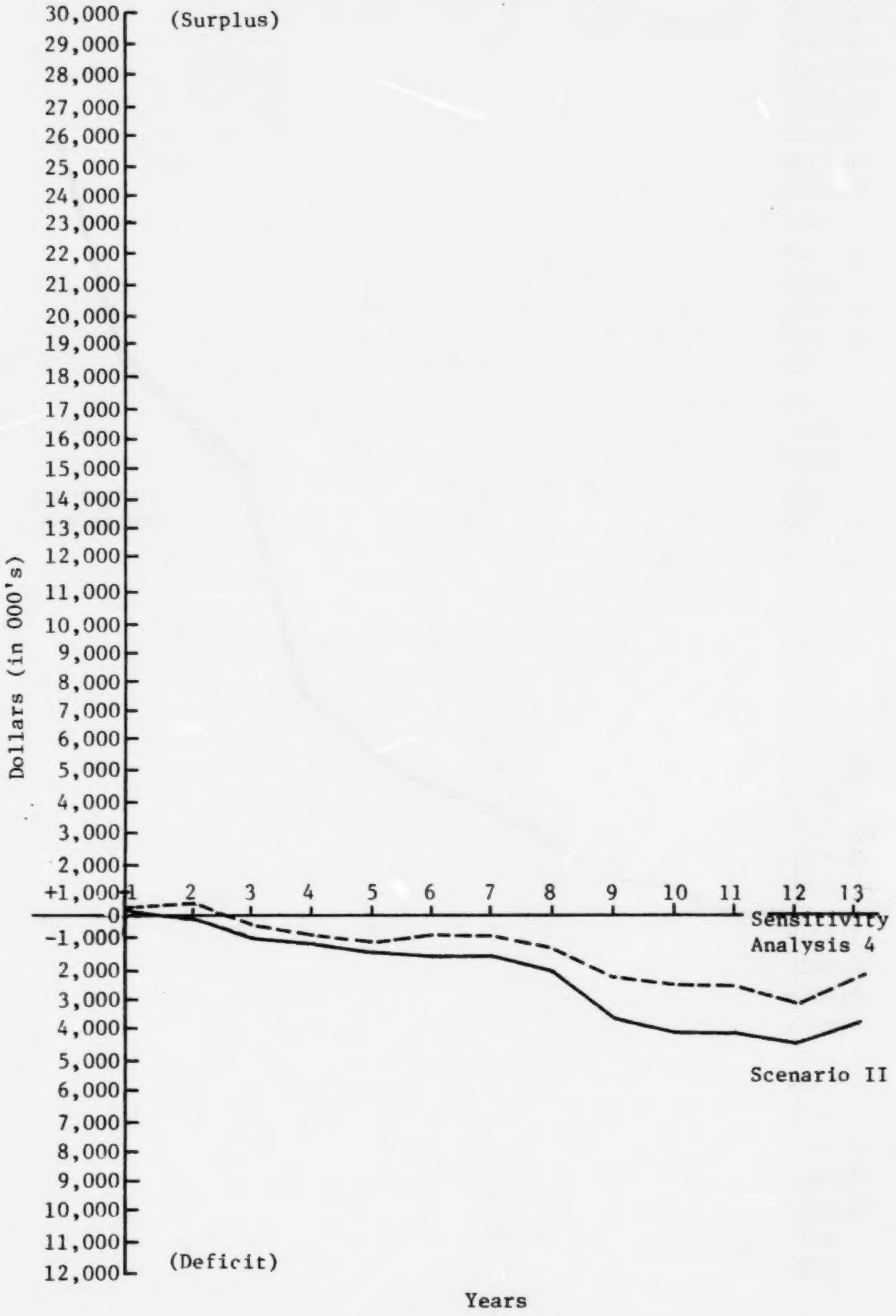
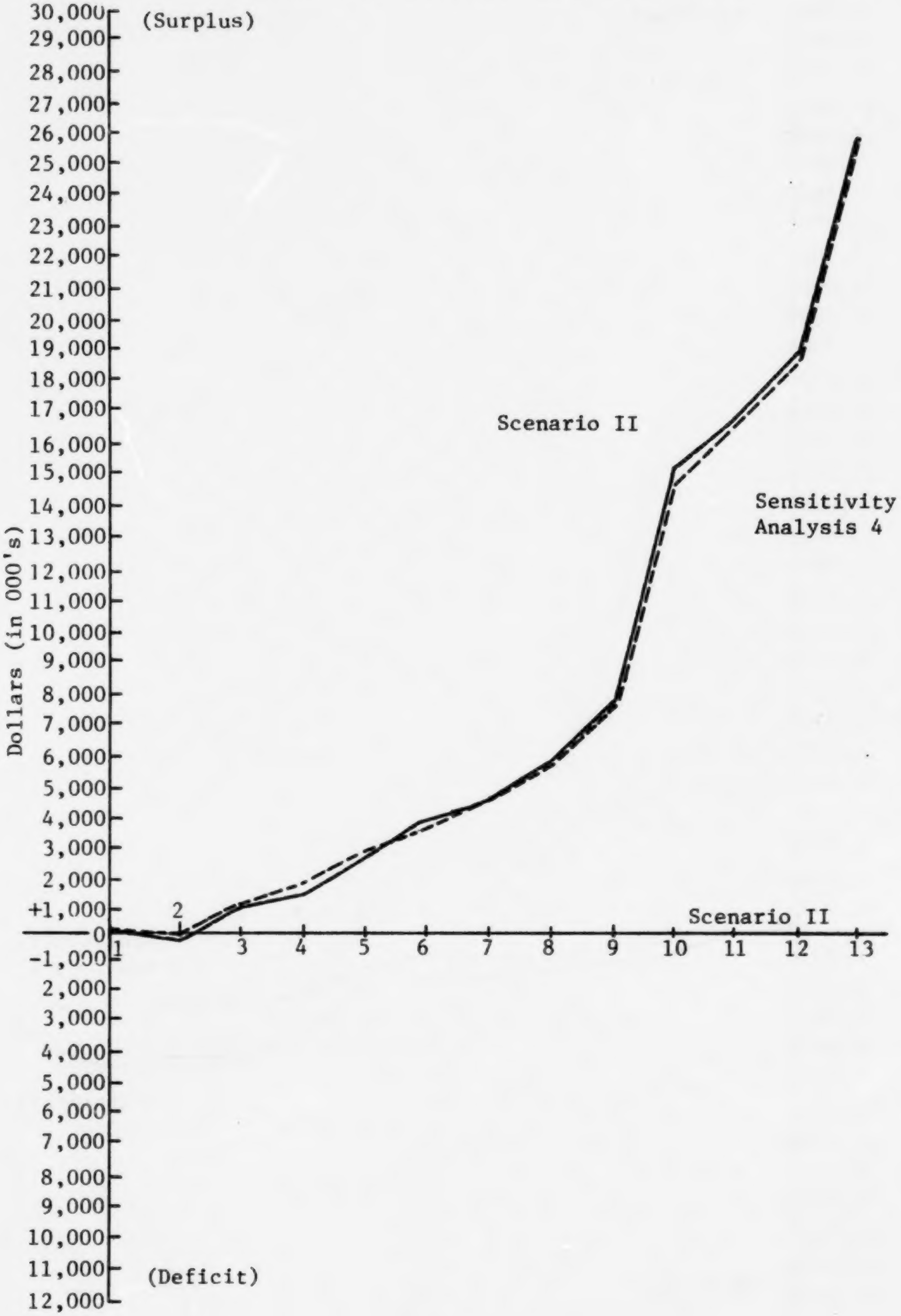


EXHIBIT F-17. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, RE 1 SCHOOL DISTRICT

The Results of Sensitivity Analysis on Scenario II vs.
Costs Based on Other Studies (S.A. 4)



Years

EXHIBIT F-18. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, RIO BLANCO COUNTY

The Results of Sensitivity Analysis on Scenario II vs. Changing Settlement Patterns to Lower Meeker Population (S.A. 2)

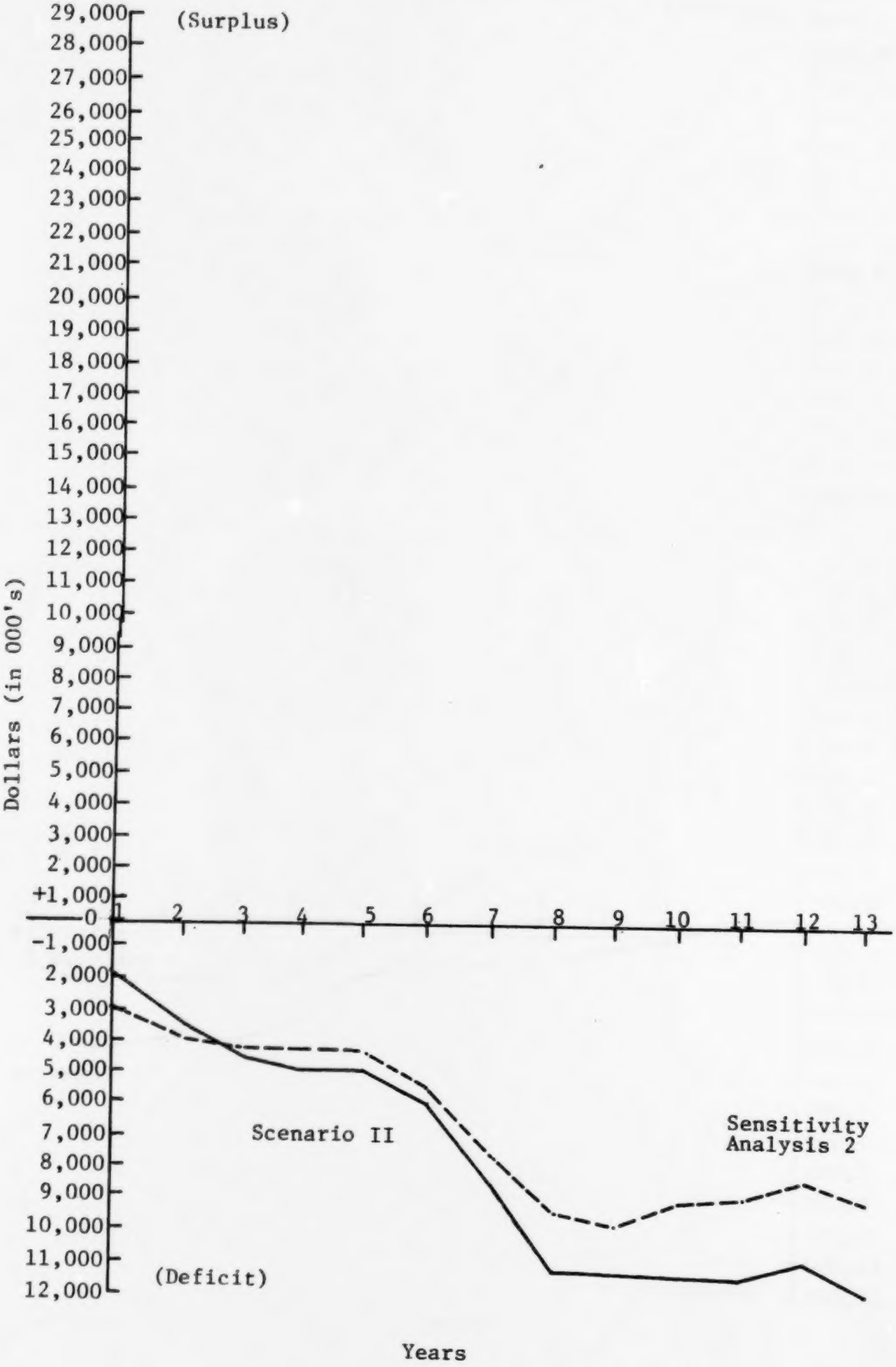


EXHIBIT F-19. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, TOWN OF MEEKER

The Results of Sensitivity Analysis on Scenario II vs. Changing Settlement Patterns to Lower Meeker Population (S.A. 2)

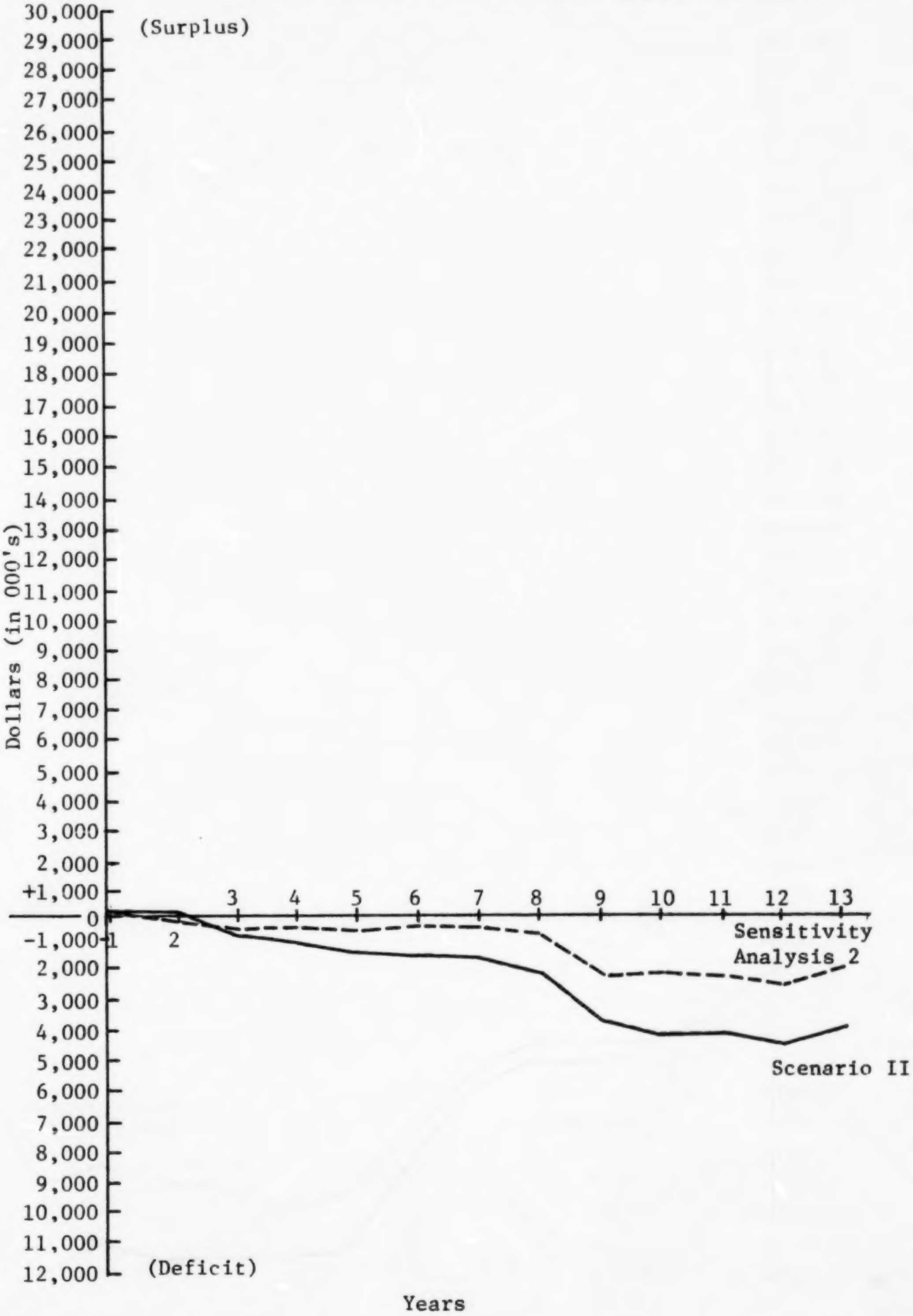
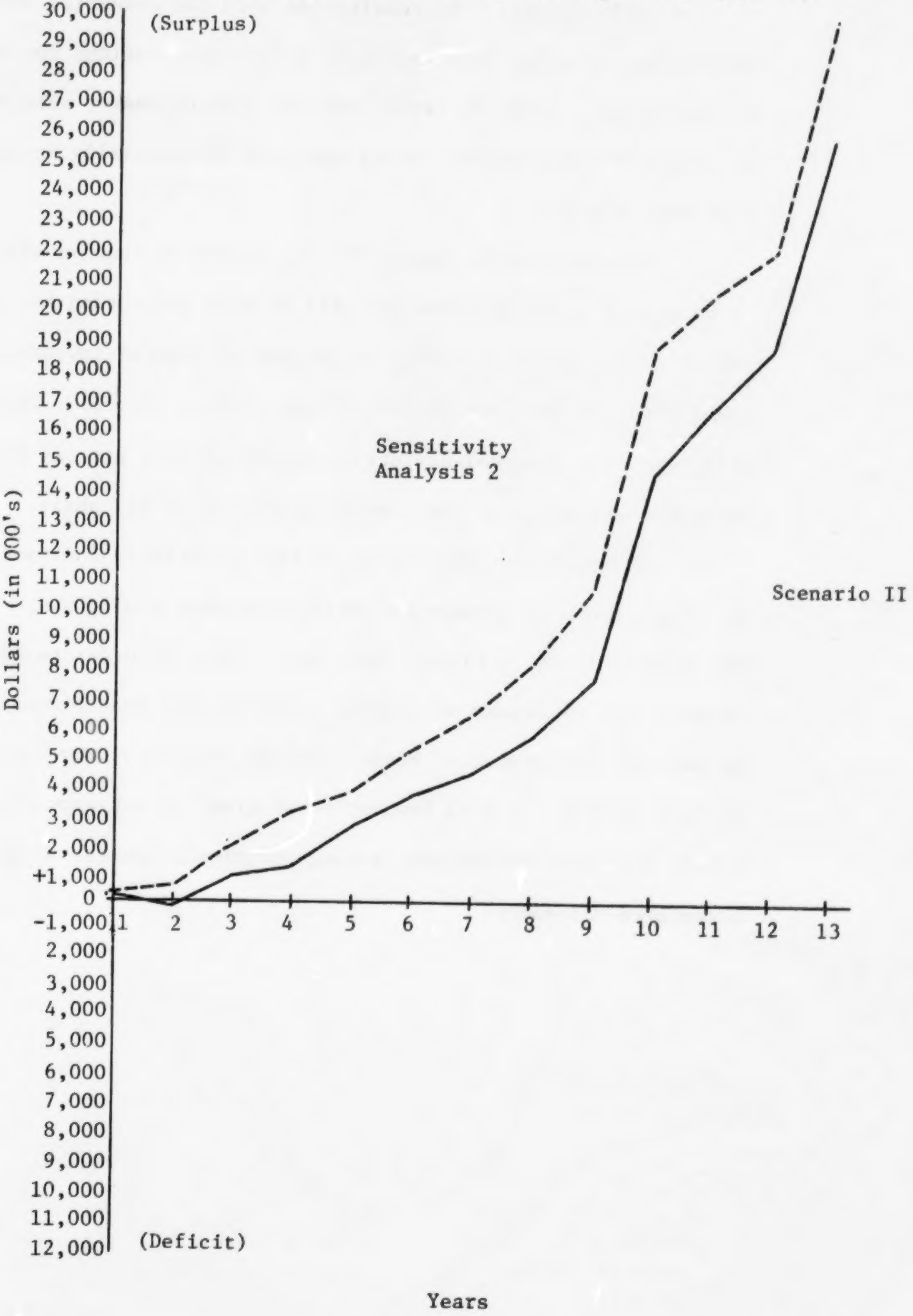


EXHIBIT F-20. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, RE 1 SCHOOL DISTRICT

The Results of the Sensitivity Analysis on Scenario II vs. Changing Settlement Patterns to Lower Meeker Population (S.A. 2)



Years

Implications. The results for both the scenarios and the sensitivity analyses have important policy implications for all three jurisdictions. Both the County and the Town of Meeker will be forced to raise tax rates and/or reduce services substantially in order to cope with growth.

One significant factor for the county is that in situ oil shale technology's assessed valuation will be much lower than for the surface retort technology (i.e., only 35 percent of capital investment is taxable for in situ vs. 70 percent for surface retort). Thus the county will need more external assistance as the in situ process proves to be more cost-effective in the commercialization of oil shale.

As seen from the results of the sensitivity analyses, a change in an exogenous or endogenous variable creates a wide range of results for a jurisdiction's fiscal condition. Thus, in order to minimize uncertainty, decisions on capital budgeting and impact assistance should be made on an incremental basis whenever possible. Revenue allocations by formula (e.g., school foundation program) do not provide enough flexibility in growth situations, making additional sources of quick response assistance necessary.

LIST OF INTERVIEWEES--SECTION F

Hartley Bloomfield, County Assessor, Rio Blanco County
Don Brossow, County Sheriff, Rio Blanco County
Martin Dicker, Economist, Colorado West Area Council of Governments
Sue Dunbar, Meeker Sanitation District
James Fudd, Wright-McLaughlin Engineers
Michael Garland, Administrator, Rangely Hospital
Bob King, Superintendent, Meeker School District RE 1
William Lucki, Fire Chief, Meeker Fire District
Meryl M. Martin, Deputy Clerk, Town of Meeker
Russ McDaniel, Administrator, Pioneer Hospital
McDonnell-Smith Engineers, Sewer System Consultants to the Town of Meeker
Duane Rehborg, Director of Planning, Rio Blanco County Planning Commission
Della Lee Wear, Budget Officer, Rio Blanco County
Bob Young, Administrator, Town of Meeker

G. Housing

Historically the cost of housing in the four-county region has been below the national average. However, since the early 70's this cost differential has been closing. Now the cost of housing in the case study area is higher than the national average due to rapid increases in demand. The "tightness" of the housing market varies by county. Mesa County is not as tight as the other three counties, because an adequate number of local developers have responded fairly well to the county's housing needs. In contrast, Rio Blanco County is just beginning to respond to housing demand and has had to rely primarily on outside developers and capital for new construction.* Garfield and Moffat Counties fall somewhere in between. Although they have a less well developed housing market than Mesa, they have attracted more outside developers than Rio Blanco County. In general, the regional housing market remains constrained.

Procedure. As indicated in Volume II, Section VIII: Housing, the housing methodology combines quantitative analysis of effective housing demand for several housing prototypes with a qualitative analysis of housing supply constraints. Applying this methodology to the northwest Colorado case study, four tasks for determining effective housing demand in the case study are considered. These are: (1) projection of the number of households by income group; (2) estimation of housing costs; (3) translation of housing costs into income requirements; and (4) estimates of effective housing demand.

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*New construction starts (single family units) in Rio Blanco County have averaged about 50 units per year.[44]

First, a projection of the number of households by income group and by employment category was computed. Estimates of total income within each employment category were calculated using mean incomes for each employment group. Employee estimates were converted into number of families and single workers (see Section D: Population and Income). This estimate was converted to an estimate of households, or housing seeking units.* Total income was distributed among the households based on the income distribution in the case study area as reported in the 1970 census.

An estimation of housing costs in northwestern Colorado was then made based on interviews with local developers, local builders, financial institutions, and/or realtors.** The most appropriate mortgage terms for the area were determined in order to translate housing costs into income requirements. Exhibit G-1 gives housing costs, mortgage terms and the resulting income requirements for the area.

An estimate of effective housing demand (i.e., units both needed and affordable) was determined by combining matrices of (1) the

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*Single workers were assumed to double up; families were assumed to contain 1.2 workers per household.

**Interviews were conducted on an area-wide basis to reflect the fact that some people go outside their immediate locale for commercial and mortgage financing.

EXHIBIT G-1. PRODUCTION COSTS AND IMPLIED INCOME LEVELS REQUIRED
FOR PRODUCTION OF NEW HOUSING IN NORTHWEST COLORADO
(1977 dollars)

	Single Family Standard Construction		Multi-Family		Mobile Home	
Production Costs	Unit construction (1000 sq.ft. @ $33/sq.ft.)	$33,000	Unit development costs:		Park development:	
	Land	1,600	Unit construction (800 sq.ft. @ $29/sq.ft.)	$23,200	Land	$ 750
	Site development[b]	5,800	Land	700	Site development[b]	4,000
	Tap fees	1,350	Site development[b]	3,200	Tap fees	1,350
	Total	$41,750	Tap fees	1,350	Total	$ 6,100
			Total	$28,450	Site rental (15% return on park development costs plus $35 per month operating expenses)	$111/mo.
			Unit rental		Unit cost (800 sq.ft.)	$12,000
			Owner's debt service	$233/mo.		
			Operating expenses (35% of gross rent)	81/mo.		
			Total economic rent required	$314/mo.		
Monthly Costs to Occupant	Mortgage payments[c]	$297/mo.	Rent	$314/mo.	Loan payments[e]	$146/mo.
	Taxes and insurance[d]	92/mo.			Taxes and insurance[d]	31/mo.
	Total	$389/mo.			Site rental	111/mo.
					Total	$288/mo.
Annual Income Required[a]		$18,672		$15,072		$13,824

a. Assumes 25% of gross income available for these housing costs.

b. Includes roads, utilities, grading, and curb and gutter.

c. Assumes 10.5 mortgages for 30 years. A 20% down payment is assumed.

d. 2.9% of total value per year.

e. Assumes 13.5% interest on loan for 10 years. A 20% down payment is assumed.

Source: DRI interviews with Colorado housing developers, realtors, and bankers.

distribution of households by income group and by employment group (described above); (2) income requirements by housing prototypes (described above); and (3) housing prototype preferences by employment groups. Housing preference assumptions are provided in Exhibit G-2. Those who could not afford their preferred type were assumed to settle for the next housing type they could afford. Those whose incomes do not qualify them for any of the housing prototypes using the standard housing financing assumptions were assigned to a fifth demand category, "residual demand."

Estimates of demand for each category were also translated into implied new units construction. These two estimates, effective demand and implied new units, are the same during periods of constantly increasing demand. During years where demand is falling, implied new construction is zero and remains zero until any excess units previously constructed are absorbed.

In addition to these quantitative assessments, qualitative assessments were made of the likelihood of types of institutional constraints which might further constrain housing supply: (1) limitations on housing entrepreneurial skills in immediate locale; (2) unavailability and/or high cost of skilled construction; (3) difficulties in assembling suitable land; (4) community infrastructure costs borne by housing developers; and (5) resistance of developers, construction lenders, and mortgage lenders to the assumption of abnormal risks. This assessment was based on interviews with regional builders, bankers, and land developers.

EXHIBIT G-2. HOUSING PREFERENCE ASSUMPTIONS BY EMPLOYMENT CATEGORY

Type of Unit	Energy-Related Construction Workers	Energy-Related Operating Workers and all Others
Single Family	46%	70%
Multi-Family	9%	11%
Mobile Home	38%	17%
Other	8%	1%

Source: Mountain West Research, Inc., Construction Worker Profile Final Report (Washington, D.C.: Old West Regional Commission, December 1975).

Results. Housing demand under Scenario I (which assumes oil shale development is not encouraged after 1981) is far less. Rio Blanco County shows an initial trend of decreasing demand for housing which begins to level off by Year 6 (see Exhibit G-3). Many existing employees directly or indirectly involved in oil shale will be expected to leave. Should developers believe this scenario is likely, they may not produce housing that will be vacant in a few years.

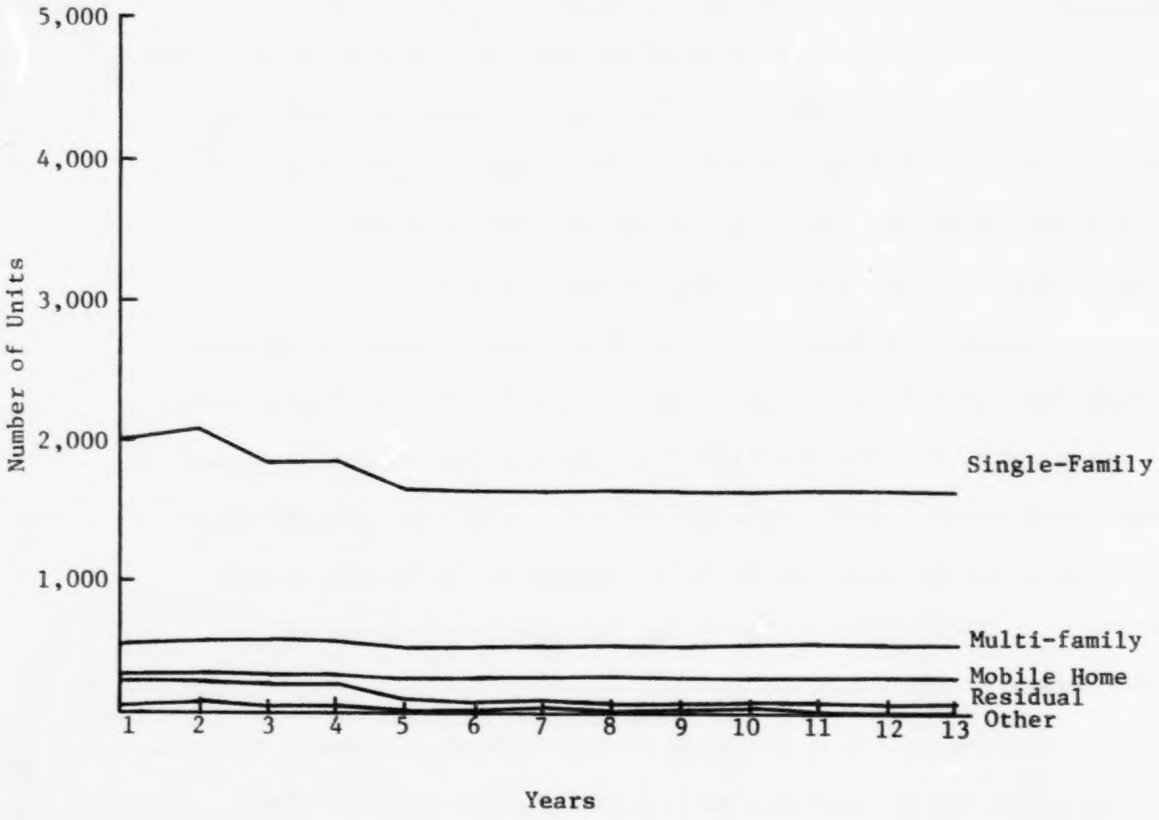
The resulting forecasts of effective housing demand under Scenario II for Rio Blanco County are given on Exhibit G-4. In general, the largest increases in demand are found during the mid-years of development (Years 6 through 9) and another large increase from Year 12 to 13. "Residual demand" is the largest category after single family demand. It is more than two times as great as the number demanding mobile homes, multi-family or other.

Exhibit G-5 shows the differences between effective housing demand and the implied construction of new units for Rio Blanco County under Scenario II. The comparisons of two interpretations of demand show years where vacancy rates may be high, reflecting periods where developers may be reluctant to build because of the danger of high vacancies. This is particularly true for the later stages of development (Years 9 through 13).

Housing demand in particular jurisdictions is closely related to the commuting and shopping patterns of the new residents (see Section E: Geographic Distributions of Impacts). Under Sensitivity Analysis 2, the road from the C-a tract to Rangely was assumed to be built and other geographic distribution assumptions were made more

EXHIBIT G-3. HOUSING DEMAND, RIO BLANCO COUNTY*

The Results of Scenario I



*There were approximately 1,647 single family units, 471 multi-family units, and 322 mobile homes in Rio Blanco County as of 1976. Sources: Department of Local Affairs, Housing in Colorado: Estimates of Housing Inventory and Household Characteristics for January 1, 1977, and Projections of Household Growth to January 1, 1982 (Denver: Department of Local Affairs, March 1978); Center for Social Research and Development, Colorado Socioeconomic Data for 1970-1975 (Denver: Denver Research Institute, University of Denver, June 1977); and U.S. Department of Commerce, Bureau of Census, Housing Characteristics for States, Cities, and Counties, V.1, Pt. 7, Colorado (Washington, D.C.: Government Printing Office, 1970).

EXHIBIT G-4. HOUSING DEMAND, RIO BLANCO COUNTY

The Results of Scenario II

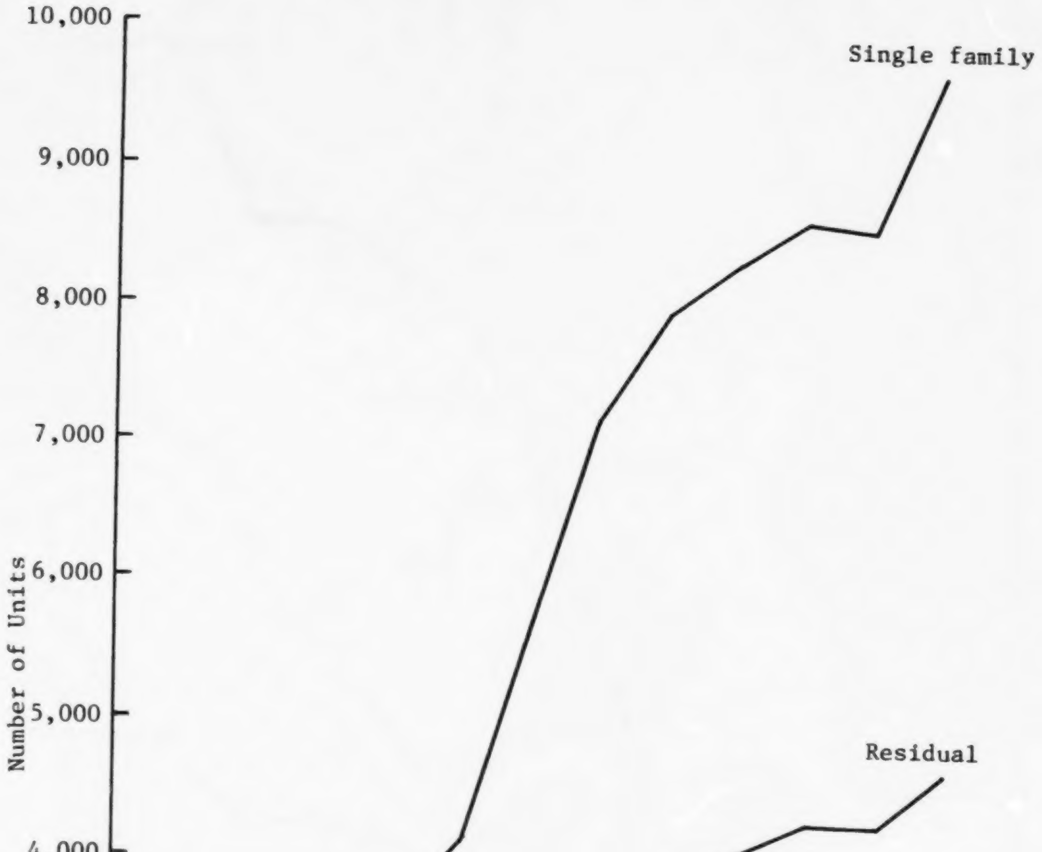
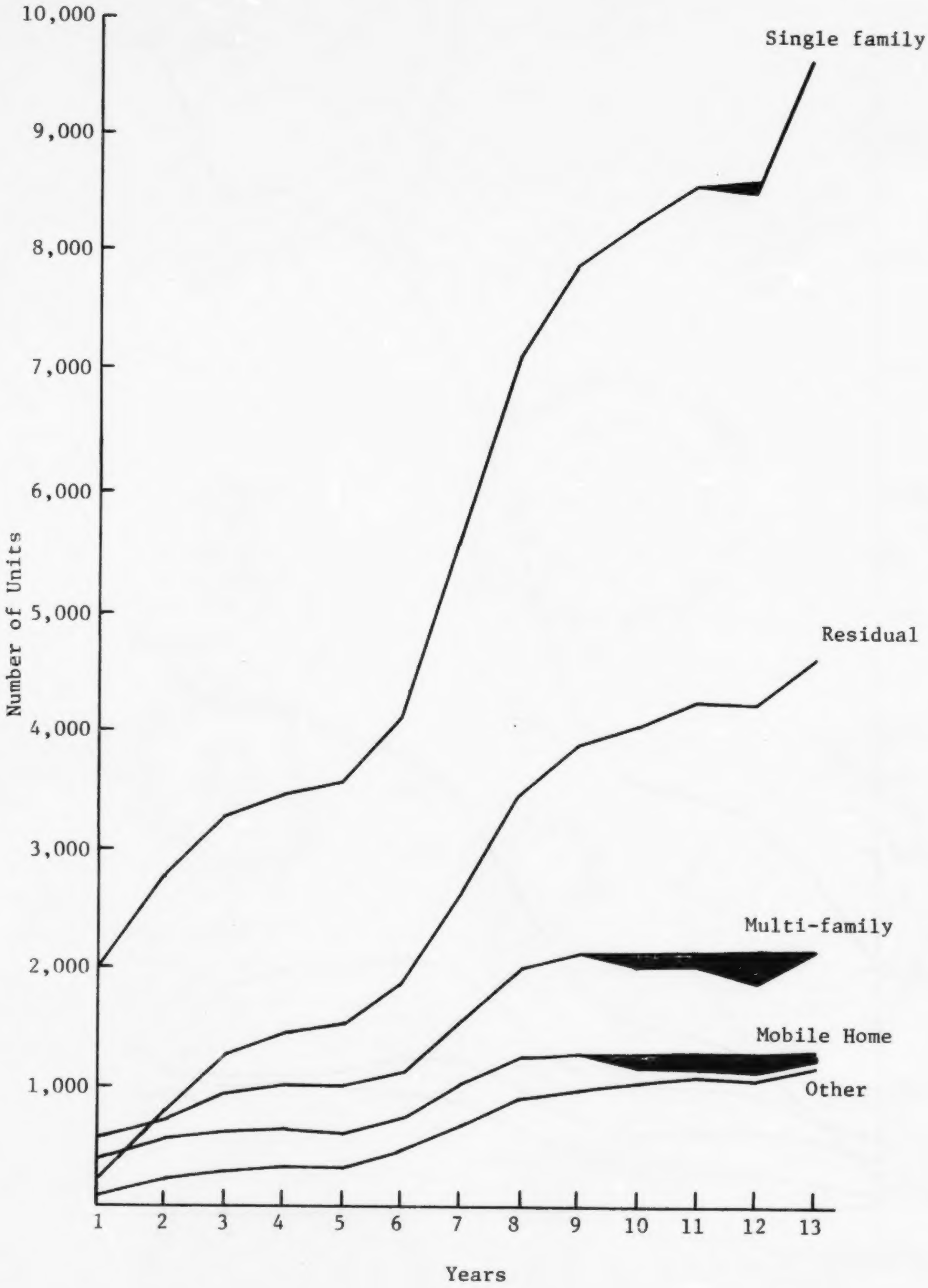


EXHIBIT G-5. COMPARISON OF HOUSING DEMAND WITH IMPLIED NUMBER OF NEW UNITS, RIO BLANCO COUNTY

The Results of Scenario II



conservative, producing a lower population estimate for Meeker. Exhibit G-6 compares total housing demand in the Town of Meeker under Scenario II and Sensitivity Analysis 2.

From interviews concerning potential institutional constraints, it appears that the housing supply response in northwest Colorado will be further hampered by shortages in the basic housing inputs (i.e., land, labor, and capital) as well as differences in attitudes towards assuming risk.

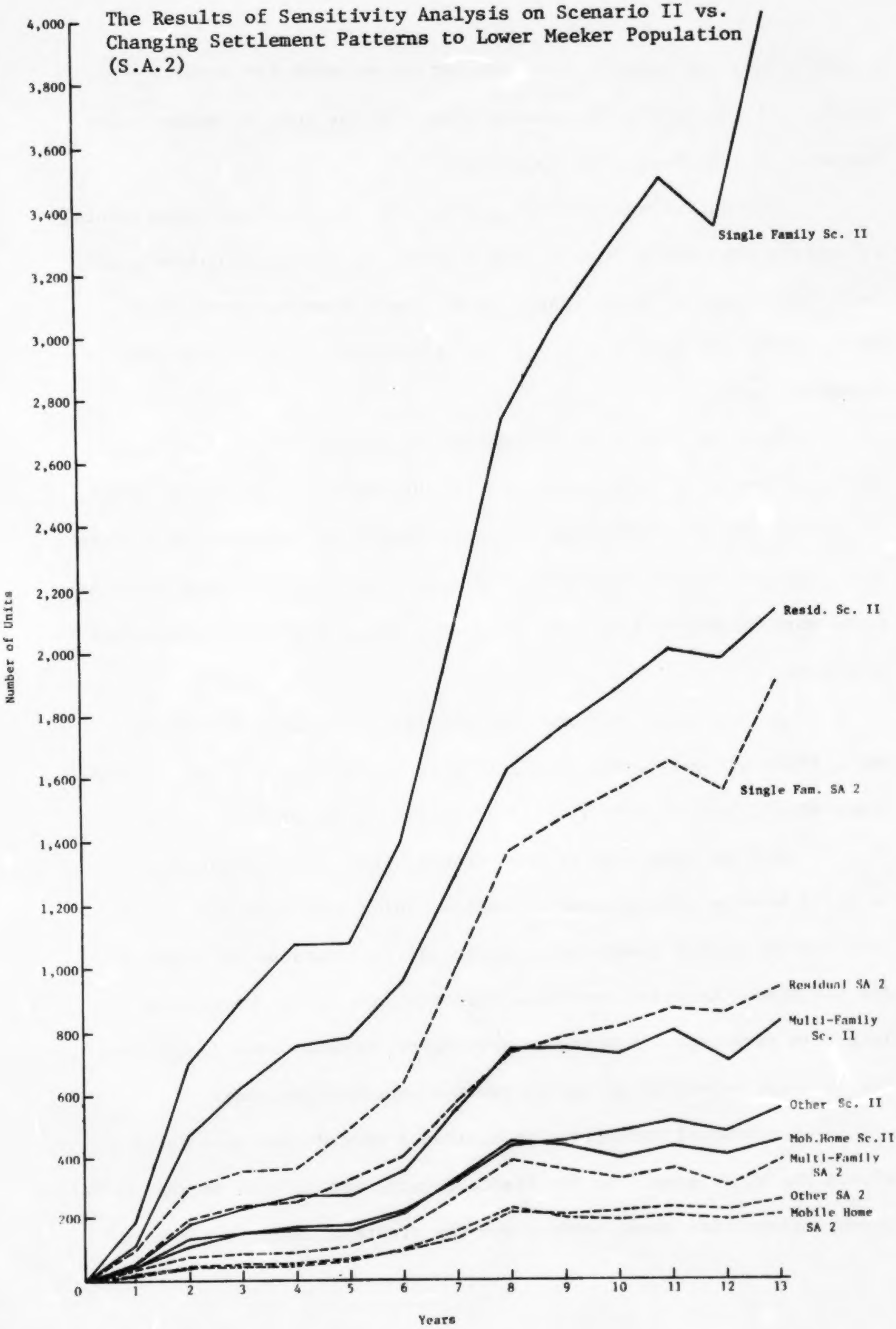
There is a shortage of commercial, construction and mortgage credit in the area due to shortages in the secondary financial market, as well as the relatively high level of demand for credit. Most financial institutions are therefore rationing credit by reviewing applications more closely and in some cases only servicing their established customers.

Land assembly problems are especially prevalent in Meeker, where there are only a few lots left open in the entire town. In the other areas, land is more readily available, although very costly.

With the exception of Mesa County, there are limitations on local housing entrepreneurial skills, which have resulted in the reliance on outside developers. Financial institutions in Garfield and Rio Blanco Counties mentioned that they are unable to provide long-term permanent financing to developers, because they do not have the in-house expertise needed to oversee construction projects.

Substantial variations in attitudes toward risk were noted within the study area. In Rio Blanco County, and to some degree in Moffat County, skepticism among lenders was the greatest, and, as a result,

EXHIBIT G-6. HOUSING DEMAND (DOES NOT INCLUDE EXISTING STOCK), TOWN OF MEEKER


The Results of Sensitivity Analysis on Scenario II vs. Changing Settlement Patterns to Lower Meeker Population (S.A.2)

more conservative lending practices are being employed by local financial institutions. These more conservative attitudes are probably tied to the uncertain nature of oil shale development in the area. As a result, more homes are being built in Rifle and population is being diverted to Rifle instead of Meeker and Rangely (see Section E: Geographic Distribution). In contrast, Mesa and Garfield Counties are experiencing growth from sources other than energy development. Mesa County is an expanding regional trade center; Garfield County, which is close to U.S. Interstate 70, is partially tied to the tourist industry.

Implications. The estimating techniques used to assess housing problems are crude. Estimating errors can be expected in housing costs, in household incomes, and in the relationship between costs and incomes. Nevertheless the results show such a wide disparity between housing needs and likely housing supply that the policy implications are not likely to be affected by these estimating errors.

The presence of a large "residual demand" category is a warning that even an efficiently functioning private housing market is unlikely to meet the housing needs of newcomers to the area. The institutional constraints which exist offer further evidence that this will be the case. In part, these institutional constraints are the result of uncertainty concerning both the future of oil shale and the likely geographic distribution of impacts. In order to be effective, housing mitigation strategies will have to address each of these different housing areas: (1) coping with uncertainty, (2) removing other institutional barriers (e.g., lack of entrepreneurial skills), and (3) altering the present relationship between new housing costs and new residents' incomes.

H. Sociocultural Impacts

As discussed in Volume II, Section IX: Sociocultural Impacts, the sociocultural changes that an energy-impacted community undergoes are likely to be profound. Identifying these changes, however, is done with great uncertainty, because societal change is usually qualitative and evolutionary in nature. The methodology applied in the northwest Colorado case study uses a step-by-step approach for going from impacts identification to monitoring and forecasting. (Demonstrated in Exhibit H-1.)

Procedure. First, an initial listing of categories of societal change was developed by combining those models used by Daniel Bell[45] and the EPA Fellows.[46] The checklist was then modified to reflect parties-at-interest perspectives.*

As discussed in Volume II, Section IX: Sociocultural Impacts, a series of causal relationships are assumed. (See Exhibit H-2.) These link societal changes to potential impacts as affected by characteristics of the existing environment and of the proposed energy development. Briefly, the linkages are:

A. Changes in social structure directly affect the state of the polity and culture.

B. Changes in social structure affect individuals, and human institutions such as families, human support systems, and communities (in both size and cohesion).

C. Changes in polity and culture affect individuals, families, human support systems, and communities.

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*See Volume III, Section I: Identifying and Analyzing Other Impacts for a list of parties-at-interest.

EXHIBIT H-1. INDICATORS OF SOCIETAL CHANGE--MEEKER, COLORADO

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
CATEGORY: ECONOMIC					
Work Satisfaction	Increased opportunity may exist for those who are presently underemployed and/or those residents just entering the work force	High existing underemployment of local residents--*Some underemployment exists, particularly in agricultural sector* High net out-migration rates for 18-22 year olds--*A few cases of young males returning to Meeker; more females are expected to stay when local service jobs open up*	Match between skills required in new high paying jobs and skills of local residents--*Those in apprentice level jobs at existing projects may be hired for new projects* Energy industry use of affirmative action guidelines in employment practices--*More females being hired for energy-related jobs*	Change in labor participation rates Changes in out-migration rates for 18-22 age cohorts Change in actual enrollment in vo-tech classes and interest expressed by high school graduates	Energy development benefits relatively few pre-development residents (Classes 1,2&3)
	Changes in working or living conditions may result in increased job dissatisfaction (e.g., stresses away from work may affect job satisfaction)	Physical and social environments which are unusual and unlikely to appeal to many newcomers (e.g., arid plains area)--*Area will not appeal to all newcomers; Meeker is situated in an arid plateau area and is fairly isolated (Grand Junction is 104 miles away)*	Shift work making it difficult to spend time with family--*Some companies only have one shift* Newcomers or local residents making sharp career changes (e.g., teachers and ranch hands becoming underground miners) Degradation of quality of life as community expands (e.g., inadequate housing and public service delivery)--*Meeker housing market is already tight*	Change in absenteeism and turnover rates Change in worker productivity Opinions expressed by energy-related workers and employees of social service agencies regarding case loads	Forecast uncertain, however, threat of increased job dissatisfaction exists (Classes 2 & 3)
	Job opportunities for women, particularly wives of incoming workers, may be limited (e.g., sales and clerical work)	Prevalence of attitudes discouraging participation of women in the work force--*Working spouse fairly common because of economic necessity, however, females in traditionally male roles are not widely accepted; those women who work are usually in services, education, or work on family ranches; a few newcomers (esp. wives of government employees) have opened their own shops since not many jobs are available or attractive*	Introduction of female newcomers (e.g., wives of construction workers) who are seeking paid employment Existence of sex discrimination in energy-related jobs--*Unknown* Creation of a small number of nonbasic jobs relative to the number of new basic jobs--*Future nonbasic/basic multiplier will be lower*	Changes in unemployment statistics for skilled and unskilled female applicants Opinions of women interviewees that jobs are easier or more difficult to obtain Number of women hired by energy industries	Eventually, a greater proportion of women who live in the community will work (Classes 2 & 3)

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Work Satisfaction (cont.)		Absence of institutional support systems for working women (e.g., day care)--*No licensed day care center although informal cooperation between mothers exists (six children is the legal limit for unlicensed operations)*	Possibility of restrictive mining practices by some energy development industries (e.g., sex discrimination on the basis of potential health hazards)	Opinions expressed by women who would enter job market if support systems in place and by those unsuccessful in obtaining employment	Family and individual emotional problems will increase, unless provision is made for working women and women new to community (Class 2)
Income Levels and Distribution	Higher paying jobs in energy industry may be taken by newcomers (perhaps leaving oldtimers actually worse off as a result of local inflation)	Available labor pool in small community may be limited--*In Meeker there are advertisements in local paper for skilled and semi-skilled workers; in Rifle, 30% of population is estimated to be older people on fixed incomes*	Newcomers qualified for skilled and semi-skilled energy jobs--*Groups of construction workers often move from construction project to construction project*	Opinions by energy officials, survey data, or actual employment data indicating that energy jobs are going to newcomers Subjective assessments by old-time residents that cost of living is higher	Older, fixed income residents are apt to suffer hardships (Class 2)
	Occurrence of wage differential between energy and local service jobs (possibly increasing income inequality in community)	Income distribution which is established and has remained relatively stable--*Few local service jobs are above minimum wage; local government wages are not competitive*	Local service employers must compete with energy industry for employees (e.g., police officers seeking energy jobs) possibly driving up wages in government and service sectors--*Former County Sheriff now Chief of Security at Colowyo; some workers from local businesses have left for energy-related employment; an informal telephone survey showed that of the majority (21) of locals who switched jobs, their former positions ceased to exist*	Earnings per employee by employment sector Changes in turnover rates in local service sectors Subjective assessments by local business people regarding wage rates and employee turnover; job vacancies posted with state employment services	Degraded local services (Classes 2 & 3)
Economic Opportunity	Opportunity for higher wages	Income levels which are established and have remained relatively stable	Introduction of higher paying energy jobs--*In Rio Blanco County the change in per capita income from Year 1 to Year 13 under Scenario II was $7,219 to $8,723 or a relative increase of 21%*	Changes in per capita incomes	Increased per capita income (Class 1)
	Increased entrepreneurial opportunities	Level of goods and services available in very small communities--*There are two small grocery stores in Meeker and only a few restaurants*	Newcomers making demands for more goods and services--*Most locals feel there is a great need for more indoor recreation; local retailers are expanding inventory in an effort to meet growing demand*	Change in the retail trade and service sector (i.e., number of new businesses and employees) Subjective assessments by old-time businesspersons that there are more business opportunities	Expansions of existing businesses and opening of new establishments (Classes 2 & 3)

(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Economic Opportunity (cont.)	Possible displacement of old businesses by major retailers	Predominance of small-scale, locally owned retail stores--*Most retail stores are family operated; some are 3rd and 4th generation establishments*	Newcomers making demands for more goods and services Tightening of local commercial credit availability as growth becomes too rapid--*Credit is currently tight in Meeker and situation likely to worsen; many borrowers must go to Grand Junction and Denver to apply for commercial loans*	Major retailers entering area (e.g., supermarkets, fast food restaurants)--*Meeker's population will have to triple (approx. 6,000 minimum) to begin attracting major retailers* Closing or sale of locally owned businesses (e.g., neighborhood market)	Displacement of pre-development middle class (Classes 2 & 3)
Regional Economic Security	New energy development may change the economic diversity of an area whose economy previously was based on agriculture or light industry	Degree of diversity in local economy--*Meeker is the county seat and serves as a regional trade center for the surrounding area which is based on an agricultural and mining economy*	Size of new energy development Duration of new energy developments--*Uncertainty as to the commercial feasibility of oil shale development* Potential of new energy development to attract linked industry and increase activity in other sectors (i.e., change in occupational structure)--*Services, trade, and state government show relative increases in employment in Rio Blanco County of 770%, 772%, and 376%, respectively, from Year 1 to Year 13 under Scenario II while agriculture increased only 21%*	Change in variety of products for external markets Change in economic stability (e.g., less volatile to cyclical fluctuations as may be found in agriculture)	Potential for diversification of local economy (Classes 2 & 3)
	New energy development in an economy based on mineral extraction may reduce the diversity and stability of the economic base	*A major concern among old-time residents is that mineral extraction which is finite could possibly displace agricultural operations*	New energy development which is of limited and/or uncertain duration and which is very large relative to the existing economic base--*Skepticism remains among some locals that the oil shale ventures will fold up; although Meeker has been anticipating and planning for growth*	Lack of alternative employment and local government revenue sources Periodic fluctuations in basic employment	Greater or lesser economic specialization, dependence on market for depletable and technologically vulnerable resources (Classes 1 & 2)
CATEGORY: SOCIAL					
Social Relationships	Present social roles and leadership styles (particularly for old-timers) may not be viable in a larger community with many newcomers	Existence of well-defined social order (e.g., a ranching elite)--*In Meeker many families are 3rd and 4th generation and have had a great role in the development of the community; social functions and political activities usually*	Large numbers of newcomers with different characteristics from local residents (e.g., income, age, education and skills) Introduction of industrial/corporate role structure into community (e.g., multi-level managerial positions)	Creation of new roles (e.g., new businesses) Old roles redefined (e.g., merchant or social worker adapting to new situation) Newcomers replacing old-timers in existing roles	More varied leadership (Class 3) More bureaucratic relationships (Class 3)

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Social Relationships (cont.)		*center around this established group*		(e.g., business, political offices) Elimination of old roles (e.g., Ma & Pa grocery store)	Changes in style of governmental decision-making (Classes 2 & 3)
	Loss of informality and support in relationships may occur as community becomes larger	Existence of great degree of informality--*In Meeker many of the families have known each other for generations; friendship and extended family relationships strongly support individuals*	Large amounts of population growth Increasing trend toward urbanization	New procedures for credit applications Requirements for ID's to cash checks Resume/form requirements for job applications Contracts	Relationships become more formalized (Classes 2 & 3)
Education	Increased demand for greater educational opportunities and/or increased need for remedial programs	Fiscal capability of school system to provide new services and/or functions--*In Colorado local district revenues from state equalization and property taxes may not be exceeded beyond the 7 to 12% level except through action of the Budget Review Board or vote of the people of the district; the school district should be helped by the revenues directly attributable to energy development within its boundaries (e.g., federal mineral royalties and PL 81-874)*	Newcomers with different educational needs--*Increased need for more remedial and special education classes, partly because many newcomers have changed schools so often*	New programs and opportunities (e.g., adult education and special education) Change in participation in PTA-type organization and school board election processes	Changes in school curriculum (Classes 2 & 3)
	Quality of educational opportunities may decrease due to strains on capacity of facilities and shortage of professionals	Condition and capacity of existing facilities and adequacy of staff--*School district in process of expanding and upgrading its facilities; a new junior high was recently completed with assistance from oil shale trust monies; a new elementary school will be needed if anticipated growth takes place* Fiscal capability of school system to expand--*(see above)* Quality and variety of existing programs and educational opportunities--*Fairfield Center and Northwest*	Possible lag in school tax revenues from newcomers and energy industry Age distribution of new students different from that of old students--*Of the newcomers that have already arrived with school age children, most have been in the primary grades*	Change in student/teacher ratio Change in truancy, discipline problems Use of temporary buildings and double shifts Turnover of teaching staff	Degraded quality of public school education, including under capacity of facilities and lack of financial resources (Classes 1,2&3)

(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Education (cont.)		*Community College can assist in providing special programs (e.g., adult education, youth activities, etc.); the school system has a successful athletic program for its students*			
Health and Safety	Quality of health care may be reduced due to strains on capacity of facilities and shortage of medical professionals	Condition and capacity of existing facilities and adequacy of staff--*Immediate need is for a new nursing home; there is presently a long waiting list* Fiscal capability of health care system (e.g., hospitals, clinics) to expand--*The 17-bed Pioneers Hospital in Meeker is presently running near capacity and is beginning to plan for expansion* Likely attractiveness of community to new health care professionals--*Presently there is only one doctor in Meeker; recruitment may be difficult because of the present facilities and the large patient load*	Large number of newcomers needing health services--*Companies contribute to health care facilities and staffing costs, have their own emergency first-aid facilities* Possible increase in occupational hazards	Change in the number of doctors per 1,000 population Subjective assessment by local residents of increased difficulty in obtaining medical services (e.g., longer waits for doctor appointments) Opinions of local health care officials regarding staffing problems	Health care facilities and professional staff overload (Classes 2 & 3)
	Fear for personal safety, particularly among old residents, may increase due to rise in crime	In small communities safety is fostered by informal mechanisms (e.g., neighbors taking care of each others' property)--*Long time residents perceive Meeker as a very safe community and consider this factor as one of its chief attributes* Limited supervised activities for younger residents--*In Meeker mostly outdoor activities and sporting events* Adequacy of staff and condition and capacity of existing facilities for formal law enforcement--*New county jail is needed now*	Larger, more diverse population including a substantial number of young newcomers	Changes in the number of arrests on felony/ misdemeanor charges Changes in precautionary efforts by old residents (e.g., locking doors at nights)	Increase in crime (Classes 2 & 3)

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Mental Health and Well-Being	Number of mental health problems may increase due to stresses from change in jobs and/or environment	Availability of social support systems (assimilation institutions) for newcomers and others with problems (e.g., mental health clinic, newcomers club, other organizational activities)--*A newcomers club has been formed in Meeker; its primary function is helping newcomers to integrate into community activities; Meeker also has a small mental health clinic (one person) which is an outpost of the N.W. Colorado Health Clinic located in Craig; there is already evidence that caseloads are growing* Stable and homogeneous characteristics of rural communities--*Meeker has a very homogeneous population mix*	Relocation of large numbers of people who have various backgrounds Possible breakdowns in other systems (e.g., inadequate recreational activities, overcrowded schools, etc.) Boredom among nonworking wives	Changes in: Divorce rates Marital/family counseling caseload Drug and alcohol related treatments	Mental health facilities and staff overloaded (Classes 2 & 3)
Cultural and Religious Opportunity	Available leisure/ cultural activities may be insufficient for growing population	Existing entertainment and recreation facilities and cultural opportunities--*In Meeker this includes the Fairfield Community Center, clubs and voluntary organizations, and school sponsored athletic programs; also, plans for a new swimming pool and tennis courts; a lack of indoor leisure activities in Meeker is a well recognized problem; residents would like to see a movie theater, more restaurants, etc.* Public and private fiscal capability to provide new entertainment and recreational activities Existing informal mechanisms for leisure activities (e.g., visiting friends and family)	Newcomers may come from larger, more diverse communities with different cultural experience and expectations--*Company sponsored recreational facilities in company-owned mobile home park and/or subdivisions*	Changes in usage of existing facilities New entertainment and recreational facilities (e.g., restaurants, community center, theaters, parks, etc.) Increased membership in organizations and special interest clubs (e.g., church social groups, gardening clubs, etc.) Formation of new organizations and/or special interest clubs	Recreational facilities overloaded and choices of activities and recreational events limited (Classes 2 & 3)

(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Cultural and Religious Opportunity (cont.)		Religion an important element in rural society (e.g., as a mechanism for meeting new residents)--*Church membership in Meeker has increased dramatically (one church reports a 150% increase), most churches are involved in programs designed to attract newcomers to church activities; one new denomination (Southern Baptist) has recently come into the town*	Newcomers seeking to become part of the community and may integrate themselves into the community through church membership	Changed number of church sponsored social and youth activities Change in number of formal organized denominations Changes in church membership Changed economic prosperity for churches	
CATEGORY: POLITICAL					
Political Participation	Existing political structure may change; old-time political elite may lose control	Existence of stable formal and informal channels for political decision-making (e.g., appointing office holders)--*In Meeker power factions are usually by function, also a lot of cross-referencing between specialized informed groups; as changes occur in Meeker, more decisions will be made by law vs. consensus* Existence of a well defined political system (e.g., a ranching elite)--*Political offices are dominated by old-timers and have remained fairly stable, however, a few federal government employees have taken some leadership roles; ranchers have typically been the most politically active (businessmen and merchants are more involved in voluntary activities such as fire department)*	Large influx of workers with different political attitudes and expectations Introduction of a new constituency including a temporary population (i.e., construction work force) and new permanent residents (i.e., operating work force) Newcomers may be frustrated because they feel they have no stake in the local government (may be only temporary residents)	Possible hegemony of newcomers in political offices or challenging incumbents Possible political conflicts between newcomers and old-timers (e.g., inter-industry and environmental conflicts) Change in political influence of labor unions Percent of new residents registered to vote Continued dominance of elected offices by old-time political elite	Political institutions and actors change (Classes 2 & 3)

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Government Responsiveness	Shortfalls in providing public services and facilities during rapid growth	Local government may be unable to respond to rapid population growth because of little experience in dealing with rapid change (e.g., lacking expertise in obtaining federal aid, planning techniques, etc.)--*Although Meeker is just beginning to feel the impacts of growth, the community has been preparing and planning for a long time; as well as having an active County Planning Commission, there is also an Impact Mitigation Task Force that deals exclusively with energy growth-related problems* Existence of formal/informal growth management techniques (e.g., planning, zoning, expansion of water system)--*Meeker has implemented all the examples listed above* Local government may be unwilling to respond to rapid population growth because of existing use of formal/informal growth management techniques (e.g., old-timers may be anti-zoning)--*Meeker has prepared zoning regulations in accordance with Colorado statutes, as well as preparing a sketch plan which shows where development should occur in the community*	Demand for services increases more rapidly than the tax base necessary to provide them Possible jurisdictional mismatches for local entities--*Although Meeker will be providing the needed services to the incoming population, it will not directly share in revenues from energy development resulting in jurisdictional mismatches* Uncertainty of energy development (start-up and phasing) leading to inability of local government to project revenues and expenditures--*In Meeker, the uncertainty of commercial oil shale development has caused difficulties in fiscal planning* Magnitude of change from the new energy development Degree of political control by newcomers Degree of intergroup harmony	Changes in per capita expenditures (with slower increase in revenues) Difficulty in accessing bond market Changes in conflicts between old-timers and newcomers (e.g., failure of bond issue votes, letters to editors, political campaigns, emergence of factions within organization) Subjective perceptions of local officials towards new stresses and demands	Local capital and operating expenditures exceed revenues (Classes 1,2&3) Degraded quality of public schools and services (Classes 1,2&3)
	Governmental processes less accessible and less responsive to individuals	Governmental processes informal, long-term individual associations	Professional management becomes greater part of local government	Change in number of professional, government employees Change in governmental expenditures	Governmental processes become formalized (Classes 2 & 3)

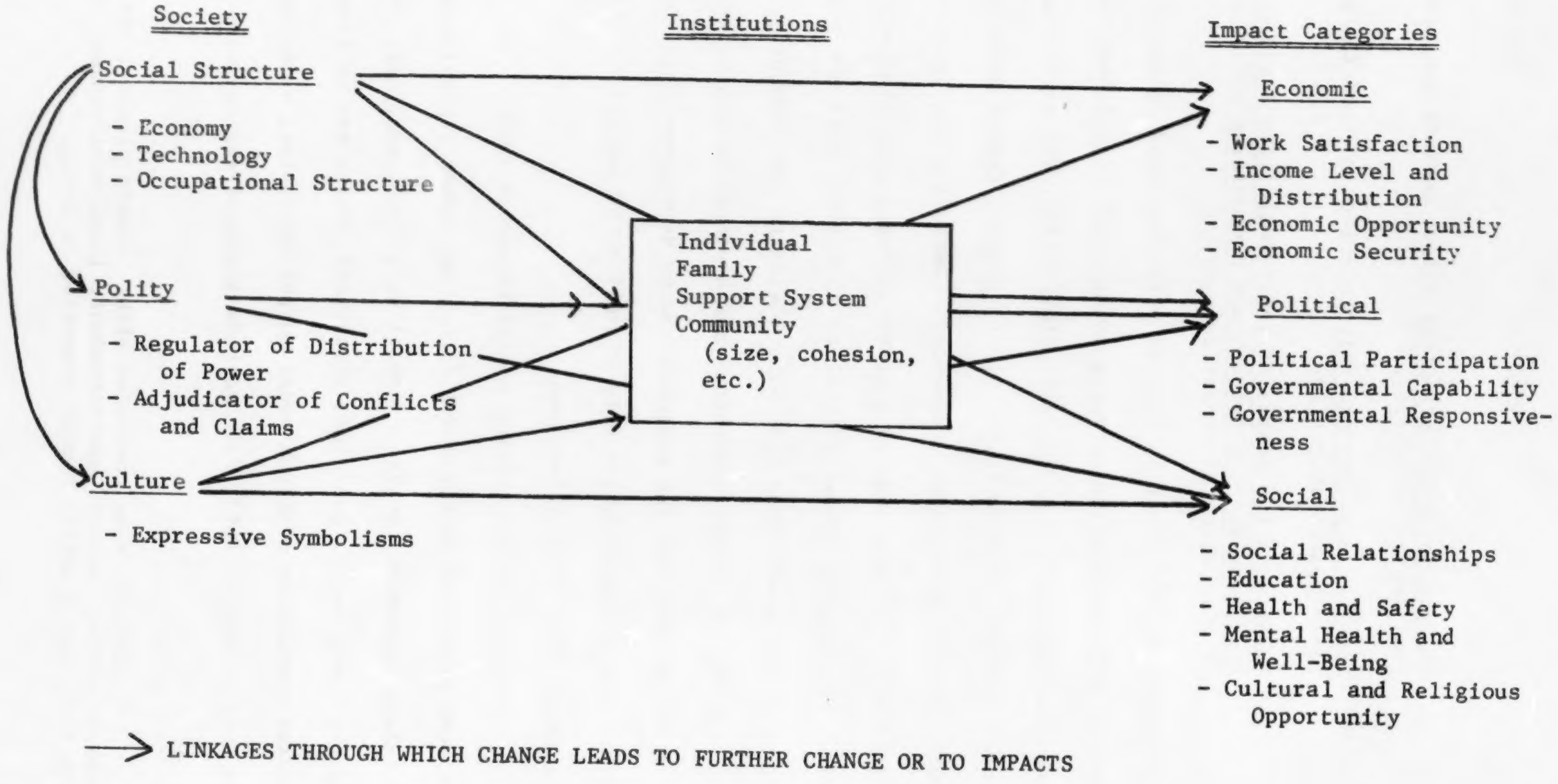
(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
CATEGORY: AESTHETIC					
Environment	Physical attractiveness of an area may decline with some physical attributes more vulnerable than others (e.g., a forested area may be more degraded by mining than would be an arid plains area)	Existing physical environment--*Meeker is located in a valley along the White River, as a result air pollutants created downstream could be blown up into the town; it is also located in an area that attracts hunters annually in the fall* Existence of environmental interest groups--*Environmentalists are typically viewed as "long hairs"; although no formal groups exist, Meeker residents are very concerned that the physical environment must not be degraded; this strong commitment is held by families who have been in the area for generations and land is viewed as an irreplaceable resource*	Type of energy development--*In the Meeker area there is surface and underground coal mining, oil shale (both surface retort and modified in situ) and a railroad spur* Extensiveness and duration of energy activities--*uncertainty as to the commercial feasibility of oil shale development* Thoroughness of reclamation project Changes in land use--*In Meeker the conversion of agricultural land into housing developments* Introduction of industrial interest groups (e.g., labor unions and management)	Change in level of air, water, and noise pollutants Change in level of litter and abandoned refuse Change in accessibility to scenic or recreational sites Possible conflict between environmental groups and other institutions (e.g., governmental agencies and industry interest groups)	Degraded quality of physical environment (Classes 1,2&3)

END

EXHIBIT H-2. LINKAGES FROM CHANGES IN SOCIAL STRUCTURE TO SOCIAL IMPACTS


Society
Social Structure
- Economy
- Technology
- Occupational Structure
Polity
- Regulator of Distribution of Power
- Adjudicator of Conflicts and Claims
Culture
- Expressive Symbolisms
Institutions
Individual
Family
Support System
Community
(size, cohesion, etc.)
Impact Categories
Economic
- Work Satisfaction
- Income Level and Distribution
- Economic Opportunity
- Economic Security
Political
- Political Participation
- Governmental Capability
- Governmental Responsiveness
Social
- Social Relationships
- Education
- Health and Safety
- Mental Health and Well-Being
- Cultural and Religious Opportunity
→ LINKAGES THROUGH WHICH CHANGE LEADS TO FURTHER CHANGE OR TO IMPACTS

D. Changes in social structure affect most of the potential impact categories.

E. Changes in polity and culture affect most of the potential impact categories.

F. Changes in the status of individuals (see B and C), families, support systems and communities affect most of the potential impact categories.

The linkages and contributing factors were displayed in matrix form and completed with information gathered using three techniques: semi-structured interviews,* participant observation, and both primary and secondary printed sources (e.g., Meeker Herald, Census data, town budgets, and local planning documents). Data from the interviews were analyzed qualitatively and, to a lesser extent, quantitatively to detect trends. The results (shown in italics in Exhibit H-1) are primarily based upon interpretations from site visits to the community.

Choice of impact indicators and appropriate analogies to the Meeker environment and the proposed energy developments was based on availability of quantitative data as well as on subjective opinion, using input from local interviews.

Finally, in forecasting social change in Meeker, the variables that were projected in the model (i.e., employment, population, wage and salary income and public finance) were first analyzed. Variables outside the model (e.g., political structure), which may be direct or indirect consequences of the model output variables, were forecast more subjectively. Subjective methods included analogy with other boom towns and inference. In interpreting the results of Exhibit H-1, the forecasts of contributing factors and impacts are shown in italics. The impact forecasts are made at three levels of confidence: Class 1--based on quantified estimates of change; Class 2--based on analogy with other boom towns; Class 3--possible or inferred, but with little information available.

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*Interviews were conducted with: county planner, city manager, newspaper editor, school superintendent, local businessmen, church representatives, and a mental health counselor in Craig.

Applying the methodology to this case study, data limitations proved to be the greatest constraint. As a consequence, the results are given in more general terms than would be desirable (see Volume II, Section IX: Sociocultural Impacts for further elaboration on the problems of forecasting social impacts).

Results. The magnitude and rate of population growth are major determining factors of social impacts. However, emerging social problems are not simply a function of aggregate size but also of population diversification. Under Scenario II of the model, Meeker's population is estimated to increase from its present level of 1,848 to 29,166 by Year 13. The magnitude of such growth is likely to have great implications for Meeker. What is less certain, however, is the composition of that new population. Presently, Meeker is a small homogeneous ranching community with a predominantly Anglo population. If the incoming workers come from a different culture (e.g., New Mexico Hispanic hard rock miners), then assimilation into the community may be more difficult. Consequences of any substantial in-migration of newcomers might include conflicts between newcomers and old-timers, an increase in mental health problems, a shift in the political structure, etc. As development continues in the Meeker area, the diversity of the in-migrants can then be better determined (e.g., through interviews with local industry).

In the remaining portion of this section, potential impacts by the four major categories (i.e., economic, social, political, and aesthetic) will be discussed in more detail.

Economic. Employment is another variable which was projected in the model (see Volume II, Section II: Description of Energy Developments and IV: Indirect Economic Activity, and Sections A: Description of Energy Development and C: Indirect Economic Activity of the Colorado case study). Employment is considered to be the primary driving force of the types and magnitude of social impacts, because it determines size of population, income levels, types of workers, etc. In the base year, total employment in Rio Blanco County is 2,548; under Scenario II, by Year 13 it would be approximately ten times greater. The shift in the occupational structure of the county would be substantial. Construction employment increases from 72 employees in the base year to 1,619 employees in Year 13. Transportation, communication and utilities employment also increases about ten-fold. In addition, services, trade and state government increase rapidly (770 percent, 722 percent, and 376 percent, respectively). Agriculture, formerly one of the largest sectors, increases only 21 percent by Year 13 under Scenario II. These shifts would have major implications for the society of Rio Blanco County as well as for Meeker, the county seat.

Per capita income would also increase as a result of the shift in the occupational structure. Under Scenario II, per capita income in Rio Blanco County was projected to be $8,723 in Year 13, compared to $7,219 in Year 1, or a real relative increase of 21 percent. This higher per capita income would cause an increase in demand for goods and services in other sectors of the economy. One example is an increase in housing demand (see Volume II, Section VIII: Housing and Section G: Housing). Scenario II gives both housing demand and new housing units for Meeker. In years where demand for housing exceeds supply, social problems, such as family disturbances, may emerge (as was the case in Craig, Colorado). Meeker is beginning to expand its new housing stock, but the prices (primarily due to the high cost of land) may be prohibitive for many workers. The shortage of mortgage credit in Meeker has further compounded the housing problem. In addition, the county has a strict mobile home ordinance which has discouraged mobile home park development in the area.

Another variable which was projected in the model and may have an effect on social impacts is public finance (see Volume II, Section VII: Public Finance and Section F: Public Finance). Scenario II output shows that by Year 13 Meeker would have a deficit of $3,528,950 and RE 1 School District would have a surplus of $26,411,089. A deficit in Meeker's budget may result in shortages of services provided, such as police protection, recreation, medical care, and, in general, a decreased quality of life. A surplus in the school district's budget, however, indicates that the high quality of education and a variety of other school-related services would be maintained or enhanced.

Social. Changes affecting the social structure (i.e., religious, cultural, and civic life of Meeker) are not direct outputs of the model and were deduced from indicators and judgments based on familiarity with Meeker and other boom towns. For example, interpersonal relationships (i.e., social roles, leadership styles, degree of informality) are likely to be affected as newcomers enter the area. This transition from an informal, personal style, to a more structured society has been noted in mature boom communities where more specialized and professional roles are needed to handle the increasingly complex demands. In the case of Meeker, there is a well-established social order where families have had ranches in the area for three and four generations and usually control the social and political functions in the community. This cohesion is likely to be diluted by the introduction of an energy-related corporate structure into the community.

Cultural changes will also be important. As discussed, the dominant culture in the community is Anglo. In Meeker, the Methodist church has the largest membership, followed by the Episcopal, Church of Jesus Christ of the Latter Day Saints, and Catholic congregations. Because of the deep roots established by many of the families, there are strong feelings of western-type self-reliance and pride in ownership. For a town of its size, Meeker has a relatively large number of year-round cultural events. Whether or not its western flavor will be attractive to newcomers depends on their cultural upbringing and expectations.

It is possible that the new population dominated by industrial workers will have different values and life-styles than the existing population. This can be determined as more newcomers enter the area. For example, ranchers in the Meeker area may not view "leisure time activities" in the same way as miners or construction workers. The newcomers may desire baseball and softball fields, bowling alleys (the lack of indoor leisure activities in Meeker is seen as a problem), and the use of farm land and open space for hunting and fishing. These desires might conflict with the ranchers' common view that land is to be conserved and valued for production of food, livestock, and hunting.

Public education plays an important role in Meeker, which prides itself on its facilities and extracurricular activities offered. However, because of the increased job opportunities at a relatively high rate of pay, high school dropout rates may climb during construction activities.

During the past five years, reported criminal offenses for Rio Blanco County (including Meeker) have shown a relative increase of 429 percent since 1972 (from a total of 117 to 503 in 1977). As Meeker grows, informal peer pressure and fear of censure is likely to become less of a community-wide deterrent.

Political. Political power in the community, which has traditionally been held by agricultural interests, may also be vulnerable to change as the mining and construction interests develop. On one hand, early in their stay, the newcomers may feel they have no stake in local government. It is just as likely, however, that the newcomers may have different political attitudes and expectations, and that they may eventually begin to run for public offices.

Because of the growth in the front-range area, more urban-rural conflict over state public revenues and over resources (flat, irrigable agricultural land useful for housing would be a prime example) might also occur. Consequently, more effective planning would be needed on the local and county level, and its implementation could create a new level of conflict.

Aesthetic. Perhaps the most potential visual change in the physical environment is the conversion of agricultural land surrounding Meeker to commercial and residential use. This prospect is more likely to be viewed as detrimental by the old-timers. They have enjoyed and adapted to the feeling of spaciousness that has traditionally been a part of the quality of life in Meeker. Also, increased traffic through the community is likely to be a source of noise and visual pollution for all residents.

Implications. The issues discussed above are given as examples of the kinds of changes that may take place, and what the likely consequences may be. These problems are expected to be the greatest during the construction phase of development, since those workers will be in the community only temporarily. Thus, it is less likely that the newcomers will adopt the values and life-style of the existing population. Rather, the existing population will probably have to cope with or accommodate to the changes. As the construction work force is replaced by the permanent mining and operating work force and their families, mutual accommodation is more likely to occur.

The policy implications for Meeker are considerable. Although no one can be certain what the social impacts will be for the community at this point, it is important that Meeker anticipate the broad spectrum of problems that can occur and be able to respond to them as they emerge. A monitoring capability would enable Meeker (or any other community) to anticipate and plan for possible changes accompanying resource development.

LIST OF INTERVIEWEES--SECTION H

Reverand Elmo Cook, United Methodist Church, Meeker
James Cook, Editor, Meeker _Herald_
Dr. Chuck Holmgrem, Colorado West Regional Mental Health Center, Craig
Bob King, Superintendent, Meeker School District
Duane Rehborg, Rio Blanco County Planning Department
Bob Young, Administrator, Town of Meeker

I. Identifying and Analyzing Other Impacts

The concepts of nonrecurring and systemic impacts for northwest Colorado were defined in Volume II, Section X: Identifying and Analyzing Other Impacts.

A detailed list of parties-at-interest to the energy resource development is a useful procedure to facilitate the identification of potential impacts, including those which are nonrecurring and systemic. Exhibit I-1 identifies parties-at-interest for the northwestern Colorado oil shale industry.

Two broad categories of additional impacts were identified--one related to agricultural changes (i.e., land and water availability), and the second related to the capital shortage in the impact area. Both impacts are potentially negative.

The first, changes in the agriculture sector of the economy, stems from a water and land use conflict between agricultural and oil shale parties-at-interest. Since northwest Colorado is an arid region, agricultural land must be irrigated in order to be productive (as evidenced by the large fruit crops in the Grand Valley area outside of Grand Junction, productivity can be high with proper irrigation). However, the area has experienced a drought in recent years as well as being limited by water compacts which were formed years ago. The magnitude of this impact will depend to some extent upon which oil shale technology is finally employed (e.g., surface retorting is more water-intensive).

The second impact, shortage in financial capital, was partially discussed in Section C: Housing of this case study. In addition to hindering housing development, this capital shortage may also inhibit the expansion of other private facilities and activities (e.g., commercial). If more capital does become available, however, there still remains the problem of perceived excess risk by private entrepreneurs. This perception of risk has been rooted in the on-again/off-again announcements from the oil shale industry. Consequently, this further inhibits response from private developers. Until the communities are convinced that oil shale development will continue, the private sector is likely to lag behind actual needs.

EXHIBIT I-1. PARTIES-AT-INTEREST TO COLORADO OIL SHALE ENERGY RESOURCE DEVELOPMENT

I. Parties Internal to the Industry

1. Plant owners and investors+-
2. Plant employees, as union or nonunion+-
3. Plant management+-
4. Previously unemployed or underemployed Coloradoans, now employed+
5. Previously unemployed or underemployed out-of-state, now employed+
6. Employees dissatisfied with quality of life (job, housing, etc.)-
7. Company employees who don't wish to relocate-
8. Industry overcharged for community development costs-
9. Employees at time of depletion or abandonment-

II. Suppliers and Customers of the Industry

10. Refineries or downstream processors in northwest Colorado+ (who could be unprofitable because of similar established Gulf Coast industries, or restrictions placed on them by air pollution regulations, e.g., PSD regulations)
11. Same, in rest of Colorado+- (same as above)
12. Same, outside of Colorado+ (markets are established enough not to be threatened by new ventures in Colorado; might use oil shale as feedstock)
13. Final users of fuel, petrochemicals and synthetics, and by-product users+
14. Local contractors, either profiting from oil shale development or losing potential jobs because of inability to compete with outside contractors+-
15. Contractor's employees, previously unemployed or underemployed, now employed+
16. Equipment suppliers+-
17. Material suppliers, including electricity+-

EXHIBIT I-1 (Continued)

18. Residents and community facilities competing for electricity, natural gas, and ending up with less-

19. Unions+

20. Lenders to successful or unsuccessful ventures+-

21. Firms either supplying new technology and scientific innovations that will be adapted for commercial use, or which will be rejected for commercial use+-

22. Firms using any "secondary" knowledge gained from technology used in oil shale development+

23. Final electrical users in another state (e.g., in Washington/ Oregon) not having to bear costs of impacts+

24. Employees dissatisfied with quality of life-

25. Contractors facing nonrecoverable overruns from boom town upsets (oil companies will not be as sympathetic as utilities) or from plant/mine shutdown-

26. Displaced employees at time of mine depletion-

27. Railroads and truckers benefiting by increased business+

III. Competitors of the Industry

28. Nearby coal operators having negative impacts from their development alleviated by oil shale impact mitigation activities+

29. Coal, or other energy sources benefiting by lack of national energy policy which encourages oil shale extraction+

30. Other sources of petroleum and gas including companies with off-shore oil, large domestic deposits, or politically "safe" foreign sources-

31. Producers of other fuels and other sources of hydrocarbon, including existing mines, suffering from employment competition-

32. Competitors in other synthetic fuel industries seeking employees, customers, or funds for impact mitigation+-

33. Nonunion operations in the region-

IV. Government in Different Levels and Roles

34. Federal government seeking domestic energy development+-

EXHIBIT I-1 (Continued)

35. Federal government with increased taxes and royalties, but little increase in demand for services+

36. State and local government (community, school and county) if and when increased revenues exceed increased costs+

37. Local government enjoying windfall from jurisdictional mismatch+

38. State and local government if given more power by federal legislation+

39. Areas developed, which should become more important relative to other state areas and possibly state to other state's lobbyists+

40. Local government (community, school, and county) faced with increased costs and complexity and population fluctuations-

41. State and local government until increased revenues exceed increased costs (level of services degraded)-

42. Local government entities suffering from jurisdictional mismatches-

43. Federal government, if it assists oil shale companies and local and state governing bodies with heavy subsidies, and later determines that oil shale technology is not commercially feasible-

44. State and local government if power or financing or technical assistance is not available-

45. Local citizens (including in-migrating), local government, and oil shale company suffering from uncertainty if company operations are delayed or stopped by state or federal regulatory agency action/conflict-

46. Local citizens (including in-migrating) government and oil shale company, if state or federal government prolongs uncertainty by postponing Energy Policy-

V. Affected Bystanders

47. Residents whose tax rates eventually are lowered+

48. Residents suffering from jurisdictional mismatch-

49. Real estate speculators+

50. Local banking institutions inadequately served by government loan programs and who lack the capital or expertise to make profit in commercial or residential lending endeavors-

EXHIBIT I-1 (Continued)

51. Mobile home dealers and landlords profiting from the development, or suffering because of financing and zoning problems interfering with development plans+-

52. Successful providers of goods and services+

53. Owners of rental housing+

54. Newcomers who neither can afford nor desire the type of housing available in local communities-

55. Real estate developers facing financing problems or large-scale vacancies in finished units-

56. Real estate developers making enormous profits from the inflated prices of new units+

57. Unsuccessful businesses (including ranches) facing higher costs and greater competition-

58. Mobile home dealers and landlords suffering because of financing shortfalls and strict local zoning and planning-

59. Local banking institutions able to capitalize off the commercial or residential building boom+

60. Residents who enjoy windfalls from jurisdictional mismatch+

61. Residents facing higher taxes and living costs, without incremental income-

62. Recreational developers (bowling alleys, etc.)+-

63. Residents facing reduced quality of life, including senior citizens, persons on fixed income, and children-

64. Residents resentful of industrialization or urbanization, including residents who reject role changes that they may be forced to make-

65. Residents whose services are cut by inadequate local or state government finance-

66. Water users facing increased costs or reduced supplies or quality of water, e.g., ranchers, recreationalists-

67. Second homeowners, recreationalists and tourists-

68. Environmental activists and organizations+-

69. In-migrating workers who are dissatisfied with quality of life and services, cost of living-

EXHIBIT I-1 (Continued)

70. Nonunion employers in the region affected by unionization-

71. Investors in housing and facilities who face extreme uncertainty+-

72. Users of high quality air (residents) affected by decreased air quality-

73. Residents of area affected by transportation impacts-

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39. DeChiara and Koppelman, op. cit.; Real Estate Research Corporation, op. cit.; and Gilmore, et al., op. cit.

40. Real Estate Research Corporation, op. cit.

41. Ibid.

42. Means Company, op. cit.

43. Ibid.

44. Colorado Department of Local Affairs, Housing in Colorado: Estimates of Housing Inventory and Household Characteristics for January 1, 1977 and Projections of Household Growth to January 1, 1982 (Denver, Colorado: May 1978).

45. Daniel Bell, The Coming of the Post-Industrial Society (New York: Basic Books, 1973).

46. Booz Allen Public Administration Services, Inc., The Quality of Life Concept: A Potential New Tool for Decision-Makers (Washington, D.C.: March 1973).

47. Meeker Herald, March 16, 1978.

2. SOUTHEASTERN UTAH CASE STUDY

A. Description of Energy Development

Section II: Description of Energy Developments, in Volume II covers the various methods of gathering basic employment information. Two contrasting procedures were chosen as the basis for the southeastern Utah case studies. In the first, only secondary material available from the state or federal government was used to develop the scenarios. This is referred to in the following sections as the Utah secondary case study. In the second, or Utah primary case study, future employment data were collected through local press announcements and personal interviews with industry representatives and government officials.

Because information was incomplete in both instances, rules of thumb were developed. These were used to relate employment to capital investment, and output to employment and/or capital investment. Exhibit A-1 shows these rules of thumb. In the secondary run they were based on reports of mines already in existence. After interviewing industry representatives, these were altered for the primary run to reflect more recent circumstances.

In both Utah case studies each energy-related development was summarized separately giving the following information: temporary and operating employment by year, capital investment for the new or expanded mine or power plant, a yearly production build-up and the location of the facility. Examples are found in the procedure sections which follow.

EXHIBIT A-1. RULES OF THUMB DEVELOPED FOR THE UTAH CASE STUDY

Utah - Secondary Case Study

Coal

$40 M capital investment per million tpy of capacity for underground mine

$17.5 M capital investment per million tpy of capacity for surface mine

2800 tons per man-year operating employment for underground mine

9268 tons per man-year operating employment for surface mine

Utah - Primary Case Study

Coal

$20 M capital investment per million tpy of capacity for expansion of underground mine

$35 M capital investment per million tpy of capacity for underground mine

$17.5 M capital investment per million tpy of capacity for surface mine

2900 tons per man-year operating employment for underground mine

9268 tons per man-year operating employment for surface mine

Procedure--secondary case study. Two sources of information were used to produce the energy development scenarios. The first was work being done on the central Utah regional coal impact statement.* And the second was the Richfield, Utah Office of the Bureau of Land Management.

The information from the regional coal impact statement was in the form of aggregates of the coal development within four subregions (see Exhibit A-2). There were originally four levels of development. The first was considered the baseline and the second level the regional analysis. The third was eventually considered the highest development scenario when the last level of production was disregarded due to its high improbability. A description of what types of developments were contained in each is found in Exhibit A-2. The first alternative included the coal needed for the Intermountain Power Project. No construction work force was considered because it was the position of the USGS that the effect would be negligible. It was felt that either the construction employee would remain as part of the operating work force or leave and be replaced. These assumptions were, therefore, incorporated into the development scenarios.

The information on Exhibit A-2 had to be put into a form that could be utilized in the computer program. The goal was to be able to have something that could be defined as a coal mine. This was to be merely a working definition, due to the nature of the information source; the "mine" itself

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*At the time the scenarios were completed, the statement was still in progress, therefore, information was provided by Doug Kirk, a Utah state employee working on the USGS contract.[1]

EXHIBIT A-2. ACTUAL AND ESTIMATED COAL PRODUCTION IN THE CENTRAL UTAH EIS REGION
(IN MILLIONS OF SHORT TONS PER YEAR)

revised
7/13/77

Sub-Region	1976 Production	1976 Workforce /1	1980 Production	1980 Workforce /1	1985 Production	1985 Workforce /1	1990 Production	1990 Workforce /1
	Actual		Estimated					
NO NEW FEDERAL ACTION, includes only existing operations, expansion of coal production to meet established consumer demand.								
C-1	1.413		1.4	410	1.4	410	1.4	410
C-2	3.058		4.6	1,335	6.6	1,915	8.0	2,320
C-3	2.422		5.2	1,510	7.1	2,055	7.4	2,145
C-4	1.075		1.2	350	1.2	350	1.2	350
Total	7.968	2,853	12.4	3,605	16.3	4,730	18.0	5,225
REGIONAL ANALYSIS, includes the potential for production from existing operations, detailed proposals and some preliminary proposals; coal production based on anticipated consumer demand.								
C-1	1.413		1.4	410	1.4	410	1.4	410
C-2	3.058		4.6	1,335	6.6	1,915	8.0	2,320
C-3	2.422		5.2	1,510	7.6	2,200	11.4	2,610
C-4	1.075		1.2	350	1.2	350	7.2	2,090
Total	7.968	2,853	12.4	3,605	16.8	4,875	28.0	7,430
1ST ALTERNATIVE, includes existing operations, all detailed proposals; coal production based on expansion of existing mines and production proposed in detailed mine plans.								
C-1			1.4	410	1.4	410	1.8	520
C-2			4.6	1,335	16.6	4,810	21.2	6,145
C-3			5.2	1,510	12.4	3,105	14.5	3,505
C-4			1.2	350	2.6	750	3.2	930
Total			12.4	3,605	33.0	9,075	40.7	11,000
2ND ALTERNATIVE, includes existing operations, all detailed and preliminary mine plans and production from possible new leases; coal production is sum from existing mines, expansion and all new sources.								
C-1			1.4	410	1.6	460	2.3	670
C-2			4.6	1,335	18.7	5,220	24.0	6,955
C-3			5.2	1,510	16.5	4,405	24.2	6,315
C-4			1.2	350	4.7	1,360	7.4	2,150
Total			12.4	3,605	41.5	11,445	57.9	16,090

/1 In 1976, 12.1 tons was produced per man-shift. The workforce estimates above are calculated at 15 tons per man-shift (all figures rounded); contractors should independently estimate and verify. (Includes some potential surface mining - 75 tons per man-shift)

Source: Preliminary work being done for U.S. Department of the Interior, Geological Survey, could have actually included a number of individual developments. DRI used only the USGS production and estimated manpower based on the rules of thumb given earlier.

To begin with, each subregion was designated to be a mine. Each mine then had to be placed in a county. Because the boundaries of the subregions did not follow those of the counties, some assumptions had to be developed and checked with those working on the impact statement. These assumptions, shown in Exhibit A-3, were used to assign tonnage to be produced to each mine. It was determined that in subregion C-3 of the regional analysis and the first alternative, there was a mix of surface and underground mining. Using the rules of thumb, the tonnage was broken down between the two, thus creating two additional mines.

After the production level was factored so that all intervening years were covered, the rules of thumb were used to calculate the operating work force. The capital investment was derived in the same manner. Because it was not known how long the period of investment was to be, a standard of two years was used. The investment was based on the difference in production between 1976 and 1990. Because of the way Utah taxes coal mines, half of the money was invested the first year and half the second. Individual development sheets contained the operating employment and production by year, the capital investment, the mine number, its subregion designation and whether it was underground or surface. Two examples follow in Exhibit A-4 and A-5.

Construction and operating schedules for Emery Power Plant Units 1, 2, 3 and 4 were provided by the Bureau of Land Management, Richfield,

EXHIBIT A-3. ASSUMPTIONS USED TO ASSIGN TONNAGE TO BE PRODUCED TO EACH MINE

Mine*	Subregion	County	
1-U	C-1	100%	Carbon
2-U	C-2	95%	Carbon moving to 70% in 1990**
3-U	C-2	5%	Emery moving to 30% in 1990**
4-U	C-3	100%	Emery
5-U	C-4	100%	Sevier
6-U	C-3	100%	Emery
7-S	C-3	100%	Emery
8-U	C-4	100%	Sevier
9-U	C-1	100%	Carbon
10-U	C-2	60%	Carbon moving to 87% in 1990**
11-U	C-2	40%	Emery moving to 13% in 1990**
12-U	C-3	100%	Emery
13-S	C-3	100%	Emery
14-U	C-4	100%	Sevier

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*U = underground; S = surface

**The percent changed gradually over the years due to the production schedule for the mines in the subregion.

EXHIBIT A-4. EXAMPLE SUMMARY OF COAL DEVELOPMENT

Carbon County

Mine 2 (Subregion I-C-2)
Underground

	Temporary Employment	Operating Employment	Investment	Production (MTPY)
1976		1,036	$224M	2.9
1977		1,143		3.2
1978		1,286		3.6
1979		1,429		4.0
1980		1,536		4.3
1981		1,607		4.3
1982		1,714		4.8
1983		1,750		4.9
1984		1,821		5.1
1985		1,893		5.3
1986		1,964		5.5
1987		1,964		5.5
1988		1,964		5.5
1989		1,964		5.5
1990		2,000		5.6

4-24-78

EXHIBIT A-5. EXAMPLE SUMMARY OF COAL DEVELOPMENT

Emery County
Mine 7 (Subregion II-C-3)
Surface

	Temporary Employment	Operating Employment	Investment	Production (MTPY)
1976		--		--
1977		--		--
1978		--		--
1979		--		--
1980		--		--
1981		--		--
1982		--		--
1983		--		--
1984		--		--
1985		32	} $67M̄	.3
1986		108		1.0
1987		183		1.7
1988		259		2.4
1989		334		3.1
1990		410		3.8

Utah office. Production was not needed for these units because the public finance portion of the model was being run on Carbon County, rather than Emery County. (See Exhibits A-6 and A-7.)

The basic scenario designations to be used in the central Utah impact statement were also used in the Secondary case study. Mines 1-4 and Emery Units 1 and 2* were the baseline run. Mines 5-8, Emery Units 3 and 4, and the baseline formed the low scenario or Scenario I. The second (high) scenario included Mines 9-14, Emery Units 3 and 4, and the baseline. Exhibit A-8, A-9 give total new energy employment by year by county for the two scenarios.** Scenario I was considered to be the most likely to occur and Scenario II to be a higher level of resource development which could take place, but was not as likely.

Results--secondary case study. The baseline energy employment discussed earlier was included in Exhibit A-10 to provide a perspective for comparing the employment increases in the scenarios. Energy employment is projected to increase in all three cases. The dip in Scenario I (Year 6) can be attributed to temporary construction workers leaving the area.

The employment levels for all three remain very close through Year 3, but then Scenario II begins to diverge significantly from the

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*Units 1 and 2 were already under construction (Unit 1 went on-line the summer of 1978).

**The baseline energy employment is included in each scenario.

EXHIBIT A-6. EXAMPLE SUMMARY OF A COAL FIELD POWER PLANT--830 MW

Emery Power Plant

Units 1 & 2

	Temporary Employment	Operating Employment	Investment	Production
1977	881	101		
1978	544	153		
1979	275	210		
1980	--	226		
1981	--	226		
1982	--	226		
1983	--	226		
1984	--	226		
1985	--	226		
1986	--	226		
1987	--	226		
1988	--	226		
1989	--	226		
1990	--	226	$469,000,000 capital investment	

Source: Bureau of Land Management, Richfield, Utah office.

4-24-78

EXHIBIT A-7. EXAMPLE SUMMARY OF A COAL FIELD POWER PLANT--830 MW

Emery Power Plant

Units 3 & 4

	Temporary Employment	Operating Employment	Investment	Production
1977	--	--		
1978	--	--		
1979	15	--		
1980	131	--		
1981	290	--		
1982	774	56		
1983	413	73		
1984	609	92		
1985	226	148		
1986	--	165		
1987	--	165		
1988	--	165		
1989	--	165		
1990	--	165	$666,000,000 capital investment	

Source: Bureau of Land Management, Richfield, Utah office.

EXHIBIT A-8. NEW BASIC ENERGY-RELATED EMPLOYMENT
UTAH SECONDARY CASE STUDY SCENARIO I

	Carbon		Emery		Grand		Other*		Total	
	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating
77	0	1,643	881	1,279	0	0	0	393	881	3,315
78	0	1,786	544	1,581	0	0	0	393	544	3,760
79	0	1,929	290	1,888	0	0	0	428	290	4,245
80	0	2,036	131	2,190	0	0	0	428	131	4,654
81	0	2,107	290	2,405	0	0	0	428	290	4,940
82	0	2,214	774	2,675	0	0	0	428	774	5,317
83	0	2,250	413	2,906	0	0	0	428	413	5,584
84	0	2,321	609	3,175	0	0	0	428	609	5,924
85	0	2,393	226	3,477	0	0	0	428	226	6,298
86	0	2,464	0	3,641	0	0	0	928	0	7,033
87	0	2,464	0	3,823	0	0	0	1,464	0	7,751
88	0	2,464	0	4,007	0	0	0	1,964	0	8,435
89	0	2,464	0	4,189	0	0	0	2,499	0	9,152
90	0	2,500	0	4,372	0	0	0	2,999	0	9,871

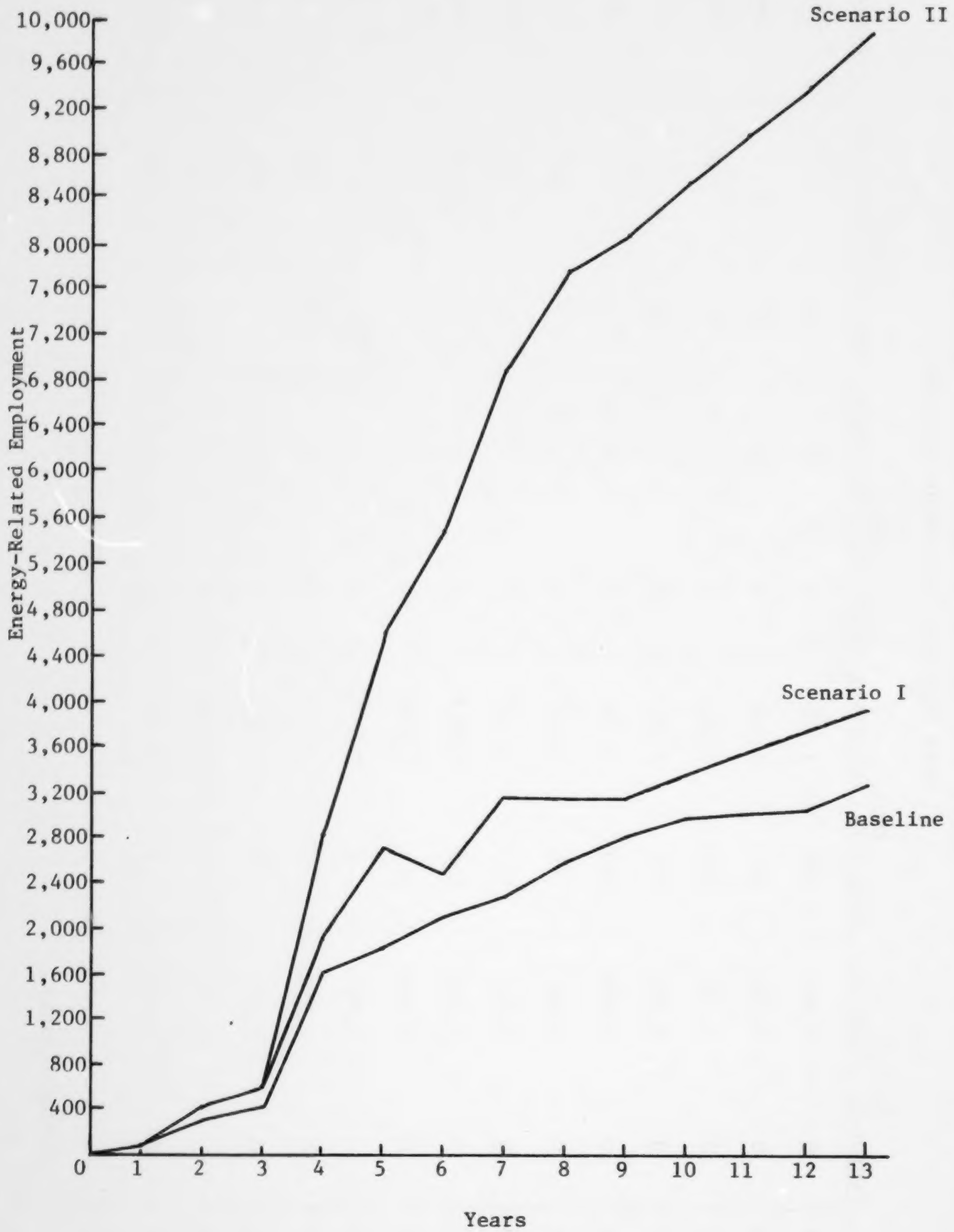
*Sevier County

EXHIBIT A-9. NEW BASIC ENERGY-RELATED EMPLOYMENT
UTAH SECONDARY CASE STUDY SCENARIO II

	Carbon		Emery		Grand		Other*		Total	
	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating
77	0	1,643	881	1,279	0	0	0	0	881	2,922
78	0	1,786	544	1,581	0	0	0	0	544	3,911
79	0	1,929	290	1,881	0	0	0	0	290	4,100
80	0	2,036	131	2,190	0	0	0	0	131	4,357
81	0	2,678	290	2,781	0	0	0	107	290	5,566
82	0	3,285	774	3,497	0	0	0	214	774	6,996
83	0	3,821	413	4,185	0	0	0	286	413	8,292
84	0	4,392	609	4,903	0	0	0	393	609	9,688
85	0	4,893	226	5,690	0	0	0	500	226	11,083
86	0	5,070	0	5,978	0	0	0	536	0	11,584
87	0	5,214	0	6,296	0	0	0	571	0	12,081
88	0	5,249	0	6,676	0	0	0	607	0	12,532
89	0	5,357	0	7,029	0	0	0	679	0	13,065
90	0	5,464	0	7,373	0	0	0	714	0	13,551

*Sevier County

EXHIBIT A-10. NEW REGIONAL ENERGY-RELATED EMPLOYMENT (CONSTRUCTION AND OPERATING) A COMPARISON OF THE UTAH SECONDARY CASE STUDY BASELINE AND SCENARIOS I AND II



other two. By Year 13 there are about 6,000 more jobs in Scenario II than in Scenario I. In the same year the new energy-related employment in Scenario I is only about 600 greater than that which was included in the baseline. This may be an indication that energy development in the baseline was overestimated.

Procedure--primary case study. In developing the energy scenarios for the primary case study secondary sources and newspaper clippings were first reviewed to determine which companies were already active in the region and which had future plans. Local government officials and community leaders were interviewed for additional development information. The companies thus identified were then contacted either in person or by phone.

The information asked of each company included projected production, projected new construction and operating employment, capital investment, the locations where present employees live and the companies' thoughts on where future employees might live.* Where specific information was not available (generally on capital investment) the rules of thumb presented earlier were used to fill the void.

The individual development sheets were prepared containing the following information: name and type of development, location by county, nearest community, temporary and operating employment by year, capital investment, production and scenario designation. Exhibits A-11, A-12 and A-13 are examples of a coal mine, uranium development and power plant respectively.*

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*For results of the last two questions see Section E: Geographic Distribution of Impacts.

In contrast to the secondary case study, the primary run had no new energy developments in the baseline. Two scenarios were formulated in order to address the major factors (both internal and external to the region) which could affect energy development in the southeastern Utah region. Scenario I includes all coal and uranium developments which can reasonably be expected to occur and four units of a power plant. The second scenario includes all the above plus two large, recently announced, coal mines (the permitting process had not been started on either), two additional power plant units and the coal needed to fuel them, and the Carbon and Emery County coal activity projected for the Intermountain Power Project. Exhibits A-14 and A-15 summarize the new basic energy-related employees by county.

Results--primary case study. For the first two years new energy employment is the same in both scenarios. Then the new developments begin in Scenario II. Initially, there is a difference of only 125 employees, but by Year 13 the high scenario has about 5,350 more than the low one. (See Exhibit A-16.) The fluctuations in employment for both scenarios are primarily due to temporary construction workers leaving the area.

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*The companies are not identified on the project summary sheets because confidentiality was promised during interviews. Companies considered in the development scenarios are: Utah Power and Light, American Coal Company, U.S. Fuel Co., Valley Camp of Utah, Inc., Swisher Coal Co., Plateau Mining, Consolidation Coal Co., Soldier Creek Coal Co., Amca Coal Leasing, Trail Mountain Mine, Union Carbide, Pacific Gas and Electric, Coastal States Energy Co., Intermountain Power Project (for coal mines) and Atlas Uranium Mill.

EXHIBIT A-11. EXAMPLE SUMMARY OF AN UNDERGROUND COAL MINE

Development: Coal Mine
County and State: Carbon County, Utah
Nearest City: Price

Low Scenario

	Temporary Employment	Operating Employment	Investment	Production (MTPY)
1977		115		500,000
1978		115		500,000
1979		155		500,000
1980		155		666,667
1981		200	$10,000,000	833,333
1982		250		
1983		310		1,000,000
1984		310		
1985		310		
1986		310		
1987		310		
1988		310		
1989		310		
1990		310		

EXHIBIT A-12. EXAMPLE SUMMARY OF A URANIUM DEVELOPMENT

Development: Uranium Development

County and State: Grand County, Utah

Nearest City: Moab

Low Scenario

	Temporary Employment	Operating Employment	Investment	Production (MTPY)
1977		185		
1978		230		
1979	65	230		
1980		230		
1981		230		
1982		230		
1983		230		
1984		230		
1985		230		
1986		230		
1987		230		
1988		230		
1989		230		
1990		230		

EXHIBIT A-13. EXAMPLE SUMMARY OF A COAL-FIRED POWER PLANT--830 MW

Development: New Power Plant--2 Units
County and State: Carbon County, Utah
Nearest City: Wellington

High Scenario

	Temporary Employment*	Operating Employment*	Investment	Production (MTPY)
1977				
1978				
1979				
1980				
1981				
1982	130		$666,000,000	
1983	398			
1984	866			
1985	491	101		
1986	573	153		
1987	144	210		
1988		226		
1989		226		
1990		226		

Assessed Valuation = $60,000,000**

*Estimates taken from Emery Power Plant Units 1 & 2 requirements.

**Estimate based on assessed valuation of Huntington Units 1 & 2.

EXHIBIT A-14. NEW BASIC ENERGY-RELATED EMPLOYMENT
UTAH PRIMARY CASE STUDY SCENARIO I

	Carbon		Emery		Grand		Other*		Total	
	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating
77	0	914	881	1,125	0	295	0	0	881	2,334
78	75	937	544	1,334	0	340	0	0	619	2,611
79	0	1,109	290	1,587	65	380	0	0	355	3,076
80	0	1,275	0	1,753	0	410	0	0	0	3,438
81	125	1,494	0	2,053	0	455	0	0	125	4,002
82	125	1,790	0	2,409	0	455	0	0	125	4,654
83	125	2,254	0	2,426	0	455	0	0	125	5,135
84	125	2,544	0	2,445	0	455	0	0	125	5,444
85	0	2,644	0	2,501	0	455	0	0	125	5,600
86	0	2,769	0	2,518	0	455	0	0	125	5,742
87	0	2,844	0	2,518	0	455	0	0	125	5,817
88	0	3,019	0	2,518	0	455	0	0	125	5,992
89	0	3,019	0	2,518	0	455	0	0	125	5,992
90	0	3,019	0	2,518	0	455	0	0	125	5,992

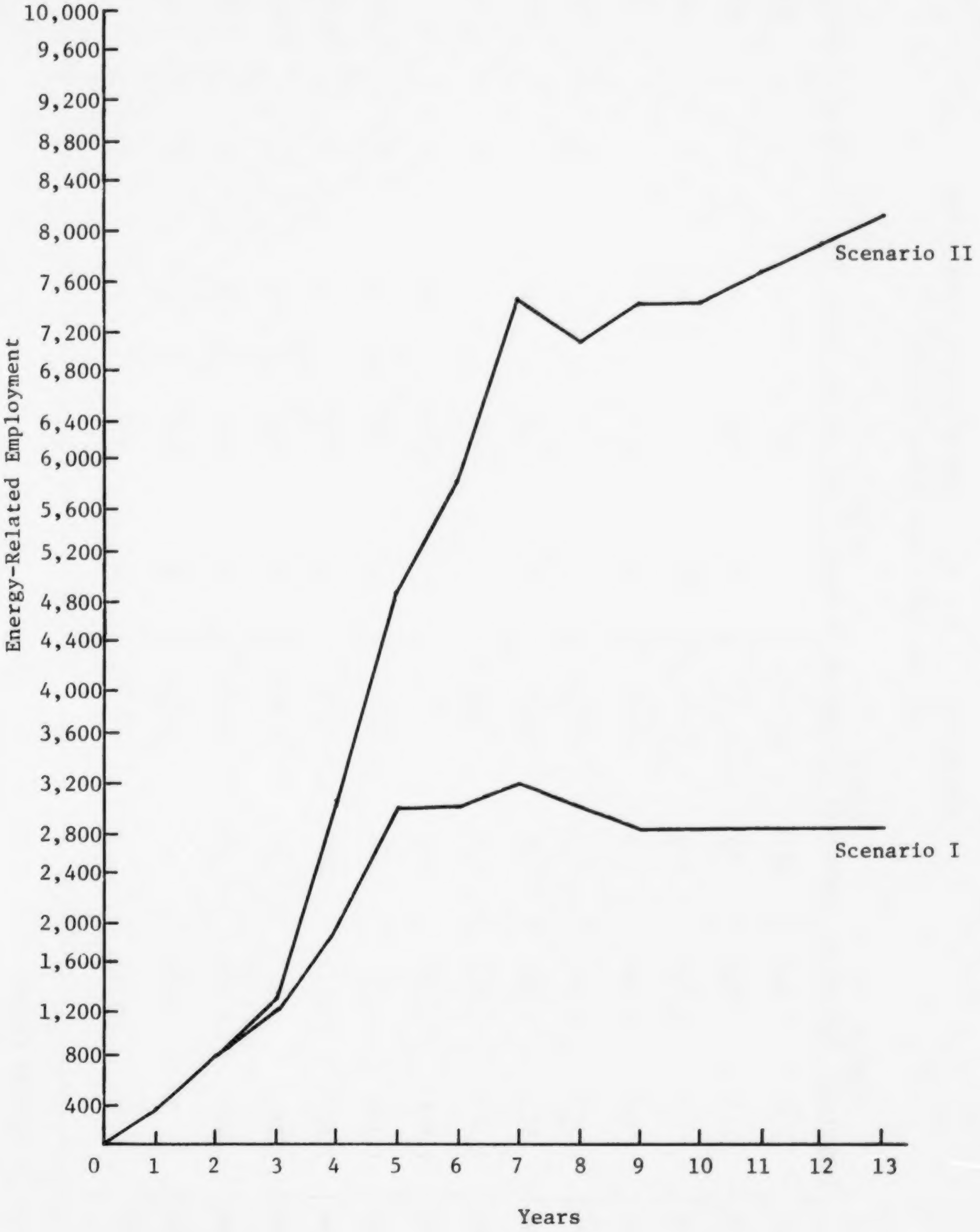
*Sevier County

EXHIBIT A-15. NEW BASIC ENERGY-RELATED EMPLOYMENT
UTAH PRIMARY CASE STUDY SCENARIO II

	Carbon		Emery		Grand		Other*		Total	
	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating	Temporary	Operating
77	0	914	881	1,125	0	295	0	0	881	2,334
78	75	937	544	1,334	0	340	0	0	619	2,611
79	0	1,109	290	1,587	65	380	0	0	355	3,076
80	50	1,350	0	1,753	0	410	0	0	50	3,513
81	325	2,282	0	2,053	0	455	0	0	325	4,790
82	605	2,996	88	2,409	0	455	0	0	693	5,860
83	1,173	3,703	210	2,426	0	455	0	0	1,383	6,584
84	1,811	4,040	360	2,755	0	455	0	0	2,171	7,250
85	1,196	4,591	195	2,851	0	455	0	0	1,391	7,897
86	1,073	4,933	150	3,157	0	455	0	0	1,223	8,545
87	394	5,507	100	3,318	0	455	0	0	494	9,280
88	100	6,109	50	3,418	0	455	0	0	150	9,982
89	0	6,274	0	3,518	0	455	0	0	0	10,247
90	0	6,415	0	3,674	0	455	0	0	0	10,544

*Sevier County

EXHIBIT A-16. NEW REGIONAL ENERGY-RELATED EMPLOYMENT (CONSTRUCTION AND OPERATING) A COMPARISON OF THE UTAH PRIMARY CASE STUDY SCENARIOS I AND II



Comparison of results, and implications. More energy employment was forecast using secondary data than when using the primary sources. While occasionally in the early years, the primary case study employment levels are greater, the end result is that there are about 1,800 more jobs under the secondary case study (Scenario II). Similarly, when comparing the first scenarios there are about 1,100 more employed people in the secondary case study.

Energy development scenarios are one of the major driving forces of any impact assessment process. It is therefore important to have employment information that is as accurate as possible. Because industry plans are always changing, the development scenarios need to be constantly updated. The danger of using only secondary sources is that the information may be old and no longer reliable (even if it is issued only a few months previously). This can mean that the employment (and thus population, public finance, housing, etc.) is either over or under estimated. Several different scenarios can be developed in an effort to minimize the problem, but this does not always alleviate the uncertainty surrounding the energy development information.

Using secondary sources as a beginning point and following up with industry interviews (either in person or on the phone) tends to produce information that is not subject to as much uncertainty--although here again, the scenarios should only be considered to be complete at the point when they must be put into the computer. Constant monitoring is very important in this phase of the assessment methodology.

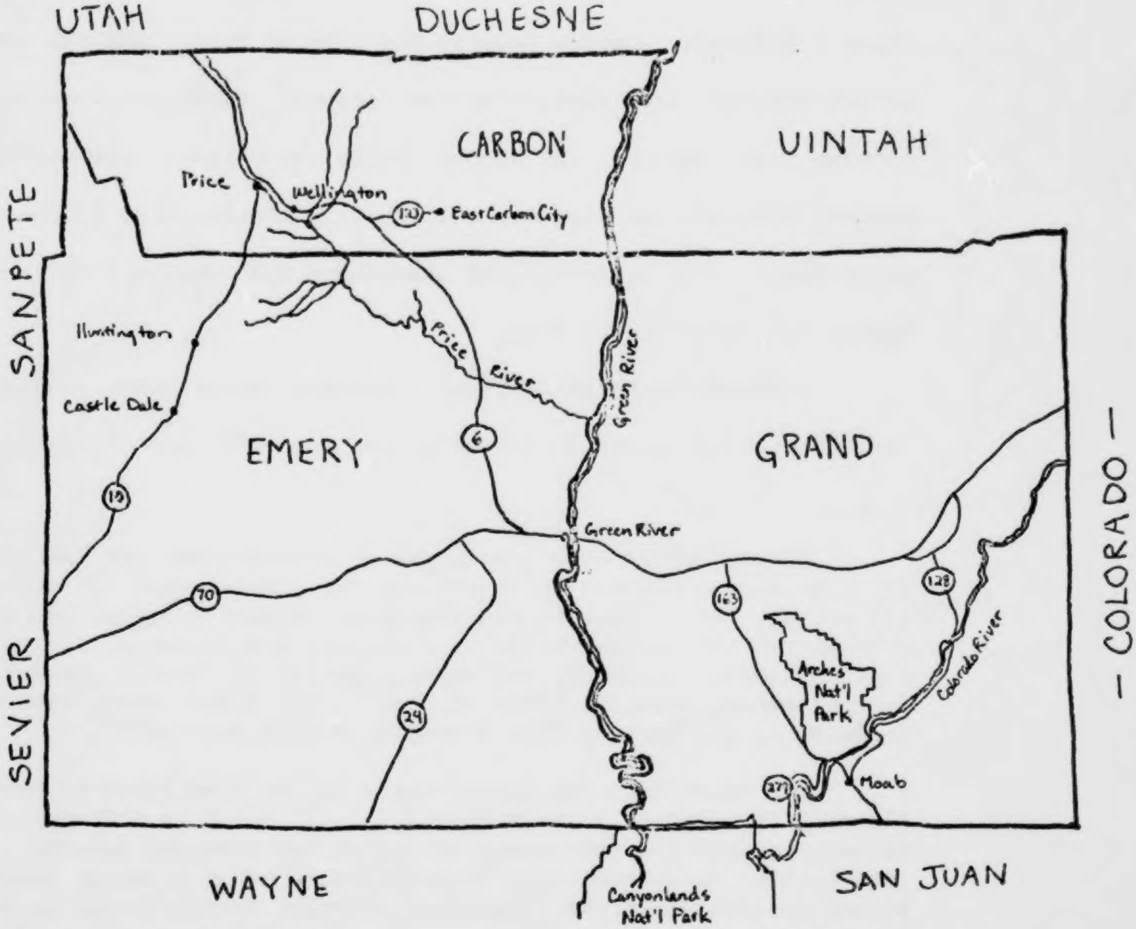
B. The Existing Community

The three counties of Carbon, Emery and Grand form the Southeastern Utah Economic Development District. The district encompasses a geographic area of 9,621 square miles, 74 percent of which is federally owned and 12 percent is state owned. There are wide variations in elevation in southeastern Utah, with about one-half of the land area being higher than 6,000 feet. Elevations greater than 10,000 feet are attained at points along the crestline of the Wasatch Plateau. Water is a scarce commodity in southeastern Utah. In the lower-elevated more populated portion of this district, rainfall is less than ten inches per year. The Price, Green and Colorado Rivers provide drainage for higher elevation watersheds. Exhibit B-1 is a map of the region.

There are a number of proposed new resource developments and plans for expansion of existing ones in this energy-rich district. Coal is the most abundant resource in the region (containing 38.9 percent of the original principal reserves in Utah). Other resources include uranium, potash, oil, natural gas, and oil shale. Utah Power and Light has completed three new electric power plant units and has plans for additional ones.

There are 15 incorporated ommunities in the district. The City of Price in Carbon County is the largest, with an estimated 1977 population of 8,200. Other communities, along with their 1977 estimated population are: Huntington (Emery County)--2,139; Castle Dale (Emery County)--1,674; Green River (Emery and Grand Counties)--1,116; and Moab (Grand County)--5,550.[2]

EXHIBIT B-1. MAP OF SOUTHEASTERN UTAH CASE STUDY AREA


UTAH
DUCHESNE
CARBON
UINTAH
SANPETE
Price
Wellington
123
East Carbon City
Huntington
Castle Dale
Price River
Green River
EMERY
6
10
GRAND
COLORADO
Green River
70
163
128
Arches Nat'l Park
Colorado River
SEVIER
24
277
Moab
WAYNE
Canyonlands Nat'l Park
SAN JUAN

Delineation of the study area.* The study area, especially Carbon and Emery Counties, represents a relatively self-contained economy.** As explained in the northwest Colorado case study, this simplifies some elements of the assessment process and increases the validity of the results. (See Colorado case study Section B: Existing Community.) Again, as in Colorado, three local jurisdictions were chosen for the public finance analyses. Carbon County, the City of Price, and the Carbon County School District were picked for two reasons. First they were expected to receive major impacts, and second, Price was a larger community than Meeker, Colorado and provided a slightly different type of test for the methodology. The sociocultural assessment was completed for a combined Carbon and Emery County area.

Economic base description. Exploitation of coal, uranium and potash has formed a substantial portion of the economic base of the region. Coal has been the prime economic force in Carbon and Emery Counties since the 1880's. These areas have historically supplied about 97 percent of Utah's coal production. However, until recent years alternative fuels have been responsible for a decline in the coal market, resulting in decreasing mine employment and out-migration of the local population. This left the counties economically depressed, with many communities slowly dying.[5] The past record of the mining industry, both in tonnage extracted and in employment (see below), demonstrates the cyclical nature of this sector of the economy.[6]

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*Southeastern Utah was chosen as a case study for two reasons. First, the Utah case study was to be done in two phases, with (1) secondary and (2) primary data; thus, it was important to have a region where sufficient development information would be available from state or federal resources. A regional impact statement was being prepared by the U.S. Geological Survey in conjunction with the State of Utah.[3] The three county district was included in the region, thus providing a good data source.

The other deciding factor was a letter from James E. Kee, Utah State Planning Coordinator.[4] He stated Utah's interest in a demonstration of DRI's methodology for the assessment of social and economic impacts. He suggested that Carbon, Emery and Wayne Counties would be of greatest interest. When it became doubtful that the Intermountain Power Project would be located in Wayne County, Grand County became the logical substitution. It is part of the same development district and has substantial amounts of uranium deposits.

**A significant amount of commuting and trading with neighboring countie exists. For Carbon and Emery Counties it is primarily with communities to the north (Provo or Salt Lake) and for Grand County it is with Grand Junction, Colorado.

Carbon County	1950	1960	1967	1970	1972
Tons Mined (1000's)	4,638	3,698	2,971	3,349	3,636
Employment	3,434	1,848	877	986	1,040

Emery County	1950	1960	1963	1970	1972
Tons Mined (1000's)	1,879	1,137	752	1,292	948
Employment	1,319	527	184	467	437

Presently, the major energy development activity in the two counties consists of underground coal mining, for both steam and coking coal, and construction of a number of power plants.

Agriculture has traditionally be an economic mainstay of the area. However, it has also been declining in recent years, due in part to mechanization. Employment in this sector fell 66 percent between 1950 and 1973 in Carbon County and 72 percent in Emery County.[7]

Although Grand County does have substantial coal reserves, most of its local economic growth is due to the mining and processing of uranium and potash, exploration for petroleum and natural gas, and tourism. Tourism and related activities, though somewhat seasonal, make up over 37 percent of Grand County's jobs in the April-September season. Moab, the largest and closest community to Arches and Canyonlands National Parks, receives nearly 14 percent of all overnight tourist stays in the state per year.[8]

Procedure--employment. The initial procedure for determining the base case employment in the Utah secondary and primary computer runs was the same for both cases. The same major data source, the Department of Commerce Regional Economic Information System (REIS), was used in both instances. Also, in dividing the sectors into basic and nonbasic components, it was difficult not to incorporate some informed judgment based on previous work in the area. Base case employment projections by county were made for ten major employment categories. Estimates were based on REIS data for 1975, the most recent year available. The 1975 figures were adjusted to a 1977 level based on the average growth rate per sector from 1971 to 1975.

These derived 1977 levels were reviewed in light of DRI's knowledge of the area and, on occasion, were adjusted accordingly. For example, using the formula, Emery County's construction sector had a growth rate of 107.58 percent. This would have meant a construction work force of 2,611 in 1977. Because the 1975 figure included the basic construction crew working on Huntington Power Plant Units 1 and 2, the growth in that sector was overstated. Therefore, the total employment for that sector was dropped to 1,180.

Next, the sectors were divided into their basic and nonbasic components using the modified "a priori" approach discussed in Section C: Indirect Economic Activity. Then growth rate projections were made for basic employment from 1978 through 1990, based on past trends and knowledge of the local area. (See Exhibits B-2 through B-4.) Exhibit B-5 gives the nonbasic employment by county for 1977. It is calculated within the computer for 1978 to 1990 using the same multiplier approach that is discussed in Section C: Indirect Economic Activity.

Another step was added to the secondary data study. As discussed in Section A, the central Utah impact statement had three scenarios, with the first being a base case assumption of what was to take place. Therefore, four mines and Emery Power Plant Units 1 and 2 were added to the secondary base case projections.

One problem with this approach is that the latest employment data at the level of detail needed were from 1975; therefore, the 1977 level had to be estimated. A second problem concerns the division of employment into basic and nonbasic components. This, as in Colorado, depended heavily on DRI's familiarity with the region. In areas where less first-hand knowledge exists, less subjective techniques (e.g., minimum requirements, shift share, etc.) could be used.

Results--secondary case study employment. Employment continues to increase in all three counties: in Carbon County the increase is about 4,000; in Emery County it is approximately 25,000; while in Grand County the increase is only 90. (See Exhibit B-6.) This occurs because two of the mines included in baseline are in Carbon County and the other two, plus the power plant, are in Emery County.*

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*Employment is reported by place of residence. Therefore, Carbon County had a greater increase because more people are expected to reside there than in Emery County. (See Section E: Geographic Distribution of Impacts.)

EXHIBIT B-2. ESTIMATES OF BASIC BASE CASE EMPLOYMENT IN CARBON COUNTY

	75	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Agriculture	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190
Manufacturing	135	165	182	201	222	245	270	299	330	365	404	447	494	546	604
Mining	1373	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Construction	100	164	164	164	164	164	164	164	164	164	164	164	164	164	164
T.C. & U.	200	204	204	204	204	204	204	204	204	204	204	204	204	204	204
Services	175	188	188	188	188	188	188	188	188	188	188	188	188	188	188
Federal Government	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
State & Local Government	519	544	544	544	544	544	544	544	544	544	544	544	544	544	544
Wholesale & Retail Trade	100	103	103	103	103	103	103	103	103	103	103	103	103	103	103
F.I.R.E.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EXHIBIT B-3. ESTIMATES OF BASIC BASE CASE EMPLOYMENT IN EMERY COUNTY

	75	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Agriculture	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326
Manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	1097	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260
Construction	480	932	932	932	932	932	932	932	800	700	600	500	400	300	200
T.C. & U.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Services	45	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Federal Government	35	34	34	34	34	34	34	34	34	34	34	34	34	34	34
State & Local Government	94	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Wholesale & Retail Trade	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.I.R.E.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EXHIBIT B-4. ESTIMATES OF BASIC BASE CASE EMPLOYMENT IN GRAND COUNTY

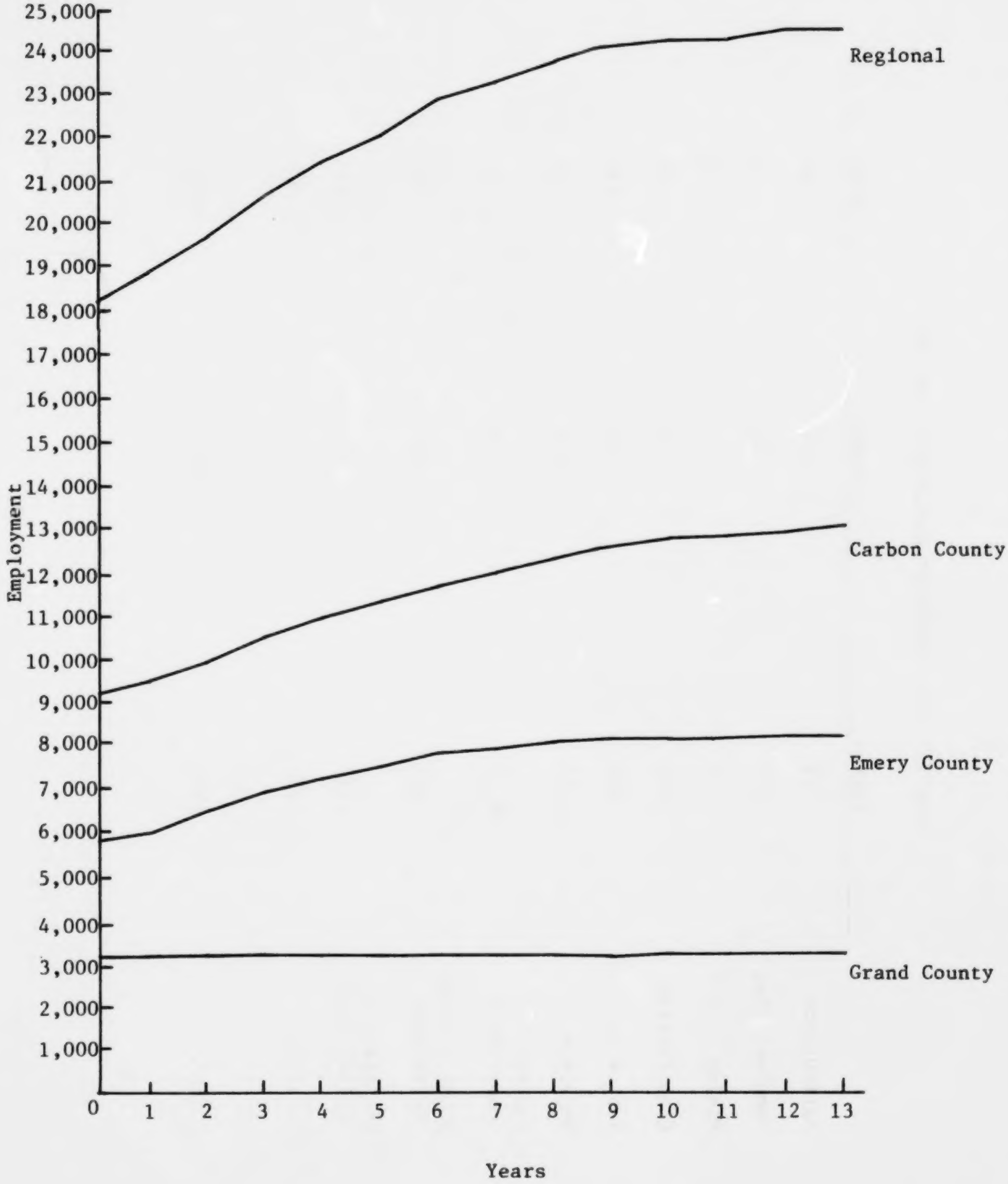
	75	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Agriculture	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Manufacturing	70	75	78	81	84	87	90	93	96	99	103	107	111	115	119
Mining	422	530	530	530	530	530	530	530	530	530	530	530	530	530	530
Construction	120	162	162	162	162	162	162	162	162	162	162	162	162	162	162
T.C. & U.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Services	138	139	139	139	139	139	139	139	139	139	139	139	139	139	139
Federal Government	70	143	143	143	143	143	143	143	143	143	143	143	143	143	143
State & Local Government	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
Wholesale & Retail Trade	150	179	179	179	179	179	179	179	179	179	179	179	179	179	179
F.I.R.E.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EXHIBIT B-5. NONBASIC EMPLOYMENT FOR 1977

	Carbon	Emery	Grand
Agriculture	47	82	14
Manufacturing	171	31	22
Mining	0	0	0
Construction	226	248	118
T.C. & U.	348	190	230
Services	1,063	428	554
Federal Government	27	8	36
State & Local Government	815	398	261
Wholesale & Retail Trade	1182	366	537
F.I.R.E.	281	17	69
TOTAL	4437	1823	1963

EXHIBIT B-6. TOTAL (BASIC AND NONBASIC) EMPLOYMENT FOR THE REGION AND COUNTIES

Results of the Utah Secondary Base Case



Results--primary case study employment. In the Utah primary data case study, the baseline was treated as it had been in northwest Colorado; that is, no mines or power plants were included. Carbon County has the largest increase in employment, about 400. Grand County remains relatively stable with an increase of only 90. Employment in Emery County decreases because basic construction workers are gradually phased down (see Exhibit B-3). The results are shown in Exhibit B-7.

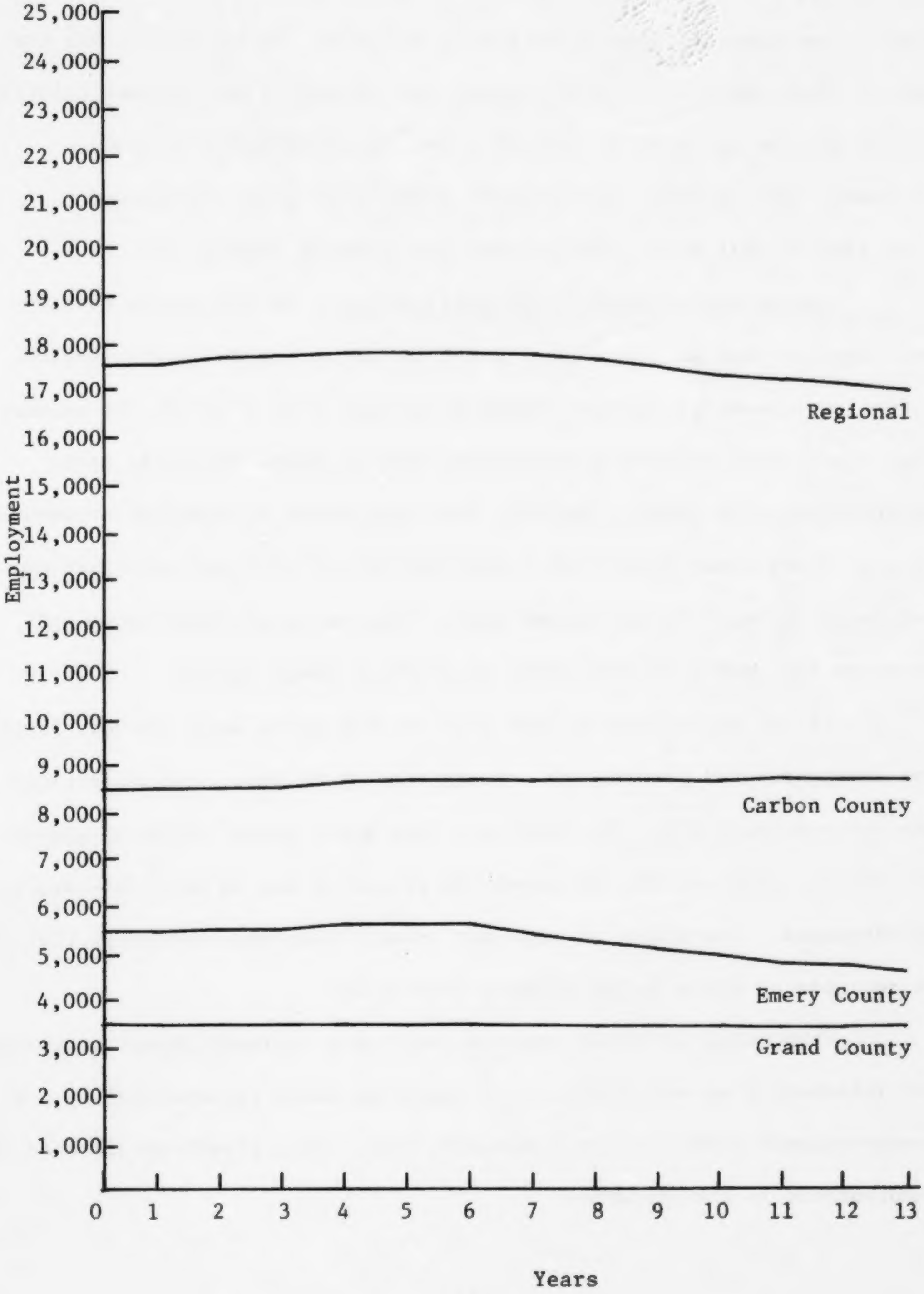
Comparison of results and implications. If all energy development were to stay at its present level in the southeastern Utah region, future employment projections would look similar to those in the primary case study, with employment decreasing only in Emery County as basic construction work ended. However, this conclusion is somewhat erroneous in that Emery Power Plant Unit 1 went on-line in 1978 and construction has recently begun on the second unit. This would probably delay and decrease the amount of employment drop-off in Emery County.

If the definition of base case is what would occur without further new energy-related growth, the primary case study base case projections are the most accurate. The secondary case study shows continual growth in the two counties, but the growth is primarily due to new coal-related developments. Therefore, it does not present base case estimates that are as reliable as those in the primary case study.

When using secondary sources, such as a regional impact statement for information on employment, care should be taken to separate any new energy-related growth from the baseline data. This growth should then be incorporated in the scenarios.

EXHIBIT B-7. TOTAL (BASIC AND NONBASIC) EMPLOYMENT FOR THE REGION AND COUNTIES

Results of the Utah Primary Base Case



Procedure--population. As could be expected from the earlier discussion of the baseline economy, Carbon and Emery Counties decreased in population from 1960 to 1970 (-25.97 percent and -7.37 percent, respectively). On the other hand, Grand County gained in population (5.4 percent). Since 1970 all three counties have gained in population. The counties' population figures from 1960 through 1977 are as follows:[9]

	1960	1970	1977 Estimate	% Change 1970-77
Carbon County	21,135	15,647	20,500	31%
Emery County	5,546	5,137	10,200	98.6%
Grand County	6,345	6,688	8,000	19.6%

The base case population projections for the three counties and the City of Price were derived from the following factors: base case basic and nonbasic employment, geographic distribution of workers and assumptions concerning family composition. After the base case employment was projected (see earlier discussion, this section), the workers were distributed by jurisdiction. The assumptions for this are discussed in Section D: Geographic Distribution of Impacts. Exhibit B-8 lists the assumptions used to estimate family status, family and single population and number of school age children. For example, if in Year 1, 100 new construction workers were allocated to Carbon County, 60 would be assumed to be heads of household and 40 to be living alone. The 60 would be multiplied by 3.59 (average size of a construction worker household) to get a family population of 215. This plus 40 singles gives a total new population of 255, with 55 school age children (60 x .92).

The population estimates for 1977 (the base year) were not the same for the secondary and primary case studies. In compiling data for the secondary run, the latest population figures available at the state level[10] were either 1976 estimates or very early ones for 1977.

EXHIBIT B-8. ASSUMPTIONS USED IN DETERMINING FAMILY SIZE

	Head of Household[a]	Living Alone	Nonhead of Household	TOTAL
BASIC EMPLOYEES				
Energy-Related Construction	0.60	0.40	-	1.00
Mining and All Others	0.80	0.10	0.10	1.00
NONBASIC EMPLOYEES	0.60	0.10	0.30	1.00

---

[a] Construction worker households are assumed to contain an average of 3.59 persons, all others 3.55. Each construction family is assumed to have .92 school age children and all others .91 school age children.

Source: John S. Gilmore and Mary Duff, Boom Town Growth Management: A Case Study of Rock Springs-Green River, Wyoming (Boulder, Colorado: Westview Press, 1975) and Mountain West Research, Inc., Construction Worker Profile Final Report (Washington, D.C.: Old West Regional Commission, December 1975).

The population estimates for the primary case study were the official ones being used by the Southeastern Utah Association of Governments.

Results--secondary case study population. The population projections shown in Exhibit B-9 follow the same basic curves as the employment estimates in Exhibit B-6. Because of the geographic distribution of population (see Section E: Geographic Distribution of Impacts), Carbon County and the City of Price gain almost the same number of residents (8,871 and 8,292, respectively). Emery County's population increases by 67 percent or 5,334. The population in Grand County holds fairly constant with a growth of only 201.

Results--primary case study population. Exhibit B-10 shows the baseline population projections for the three counties and Price. Carbon and Emery Counties and the City of Price gain residents until Year 6; then they begin to gradually drop off. Carbon County has a net decrease of eight, Emery County 1,283, while Price has 21 more residents in Year 13 than in Year 0. This occurs because Emery County's employment level declines (see above) and all three jurisdictions are affected due to the geographic distribution of impacts. Grand County again remains constant, with the same increase as in the Secondary case study.

Comparison of results and implications. For much the same reasons as those discussed under employment, it appears that the base case projections for the primary case study are more reliable. It is a better representation of a baseline population projection. Separating any new energy-related developments from base case scenarios found in secondary sources would alleviate the problem.

EXHIBIT B-9. POPULATION FOR THE COUNTIES AND THE CITY OF PRICE

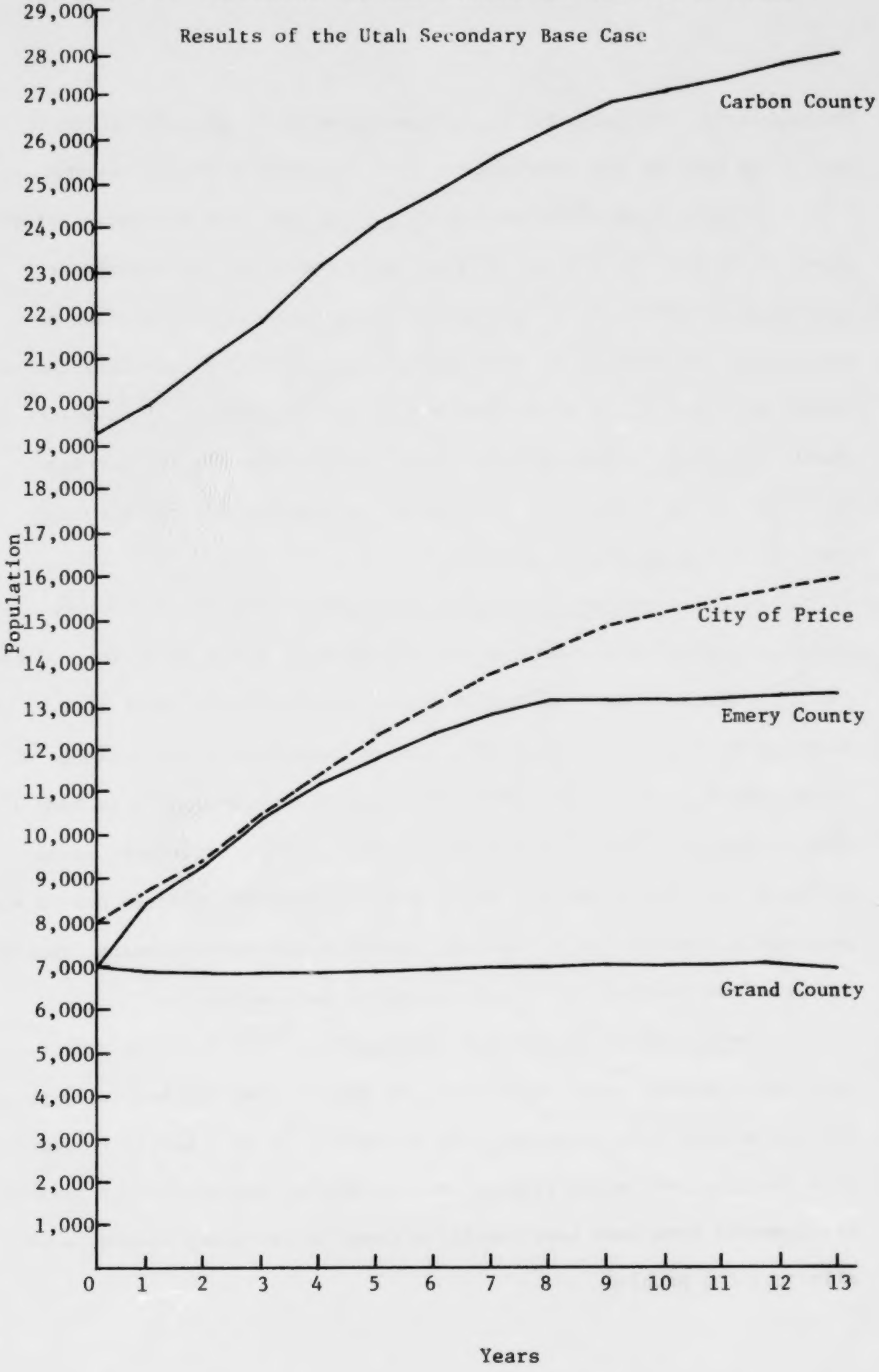
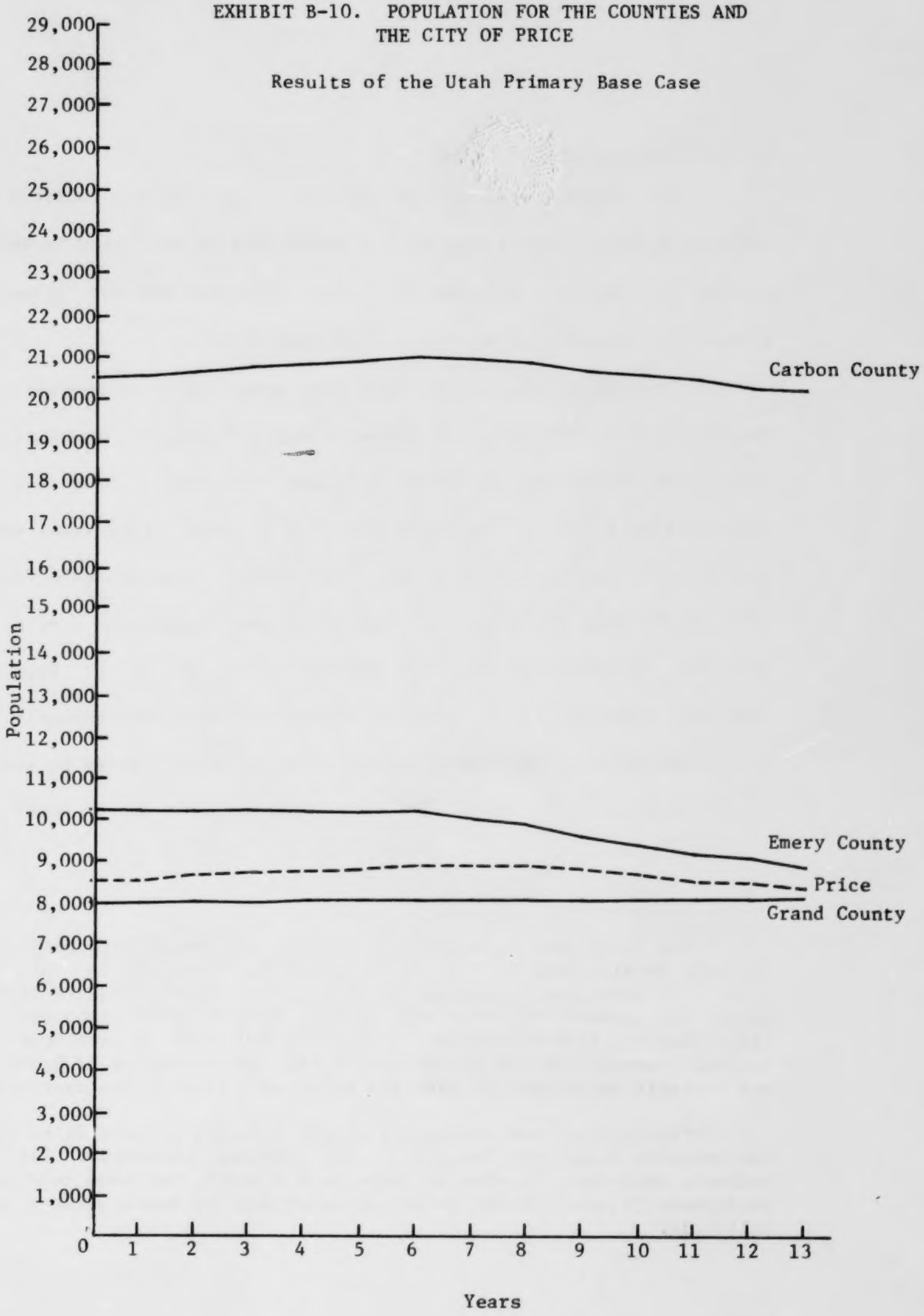


EXHIBIT B-10. POPULATION FOR THE COUNTIES AND THE CITY OF PRICE

Results of the Utah Primary Base Case



C. Indirect Economic Activity

The demonstration methodology for calculating the indirect economic activity uses an employment multiplier as described in Volume II, Section IV: Indirect Economic Activity. This approach was implemented in both the primary and secondary Utah case studies.

Procedure. Due to the fact that census data are several years old, U.S. Department of Commerce Regional Economic Information System (REIS) data on employment by county were used. The most recent data available include the years from 1971 to 1975. Employment was divided into ten categories based on SIC codes. A growth rate from 1971 to 1975 was calculated in order to project employment levels for 1977, the base year for this analysis. (See Section B: The Existing Community.) The division between the basic and nonbasic components of each employment category was determined based on knowledge of the study area.* Exhibit C-1 shows this step for Carbon County.**

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*An "a priori" approach for dividing employment into basic and nonbasic is discussed by J.A. Chalmers and E.J. Anderson.[11] This "a priori" or deductive reasoning approach uses a firm's industry classification and products together with locally derived information and classifies the firm accordingly. Chalmers and Anderson cite some general observations and approaches to the classification of basic and nonbasic employment by industry which were used in the case studies.

**Basic base case employment (years 1977-90) is calculated outside the computer model (see Section B: The Existing Community). The 1977 nonbasic employment is also an input to the model, but base case nonbasic employment (years 1978-90) is projected within the model using a computed multiplier.

EXHIBIT C-1. 1977 EMPLOYMENT (BASIC AND NONBASIC) FOR CARBON COUNTY

	1977 Total	% Basic	Basic Employment	Nonbasic Employment
Agriculture	237	80%	190	47
Manufacturing	336	49%	165	171
Mining	1,750	100%	1,750	0
Construction	390	42%	164	226
T.C. & U.	552	37%	204	348
Services	1,251	15%	188	1,063
Federal Government	137	80%	110	27
State & Local Government	1,359	40%	544	815
Wholesale & Retail Trade	1,285	8%	103	1,182
F.I.R.E.	281	0%	0	281

An employment multiplier for the three-county area was calculated using the basic/nonbasic division in the most recent actual data, from 1975, and was determined as follows:

	Basic Employment	Nonbasic Employment
Carbon	2,902	3,836
Emery	2,077	1,478
Grand	1,090	1,688
Total	6,069	7,002

$$\text{Regional multiplier} = \frac{7,002}{6,069} = 1.15$$

As described in Volume II, Section IV: Indirect Economic Activity, a lag of three years was used in both the primary and secondary data runs of the Utah case study.* Given the above derived multiplier of 1.15, this would imply that for every 1,000 new basic employees entering the case study area in Year 1, 1,150 new nonbasic workers will be generated by Year 3. During each year, then, only one-third, or 383 workers, is added to the total population.

A final adjustment to the multiplier was made using an accelerator to account for increases in nonbasic construction activity. The new employment generated by the accelerator was lagged over a two year period.** (See Volume II, Section IV: Indirect Economic Activity for a detailed description of the accelerator.)

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*Generally, in impacted communities, investments in nonbasic activities are delayed by a combination of economic and institutional factors. The lags used in the model are assumed to affect the computed nonbasic component of total employees and the additional employees computed by the accelerator effect.

**The accelerator principle is based on the fact that during periods of rapid community growth, the existing nonbasic capital stock is quickly absorbed by nonbasic industries. Continued growth requires a large number of construction workers just to increase the capital stock. Also, each new capital construction worker demands nonbasic goods and services which require further capital additions. The accelerator formula used in the model is given below.

Results--secondary case study.* Exhibit C-2 presents the forecasts derived with secondary source data of total employment for Carbon County, for Scenarios I and II. The large differences in total employment occur after Year 3, and by Year 8, the gap widens to 7,491. By Year 13, the difference has increased somewhat to 8,674. These discrepancies reflect the variation between scenarios in basic energy-related jobs, as well as the nonbasic work force to be generated by such jobs.

(footnote continued from previous page)

Total number of capital construction employees in time t is equal to:

$$C\cdot\Delta E_t\left(1+\frac{C\cdot NB}{1-(C\cdot NB)}\right)$$

and the additional nonbasic support in time t is equal to:

$$NB\cdot C\cdot\Delta E_t\left(1+\frac{C\cdot NB}{1-(C.NB)}\right)$$

where:

ΔE_t = original change in employment

C = number of person years of capital construction required for each ΔE_t

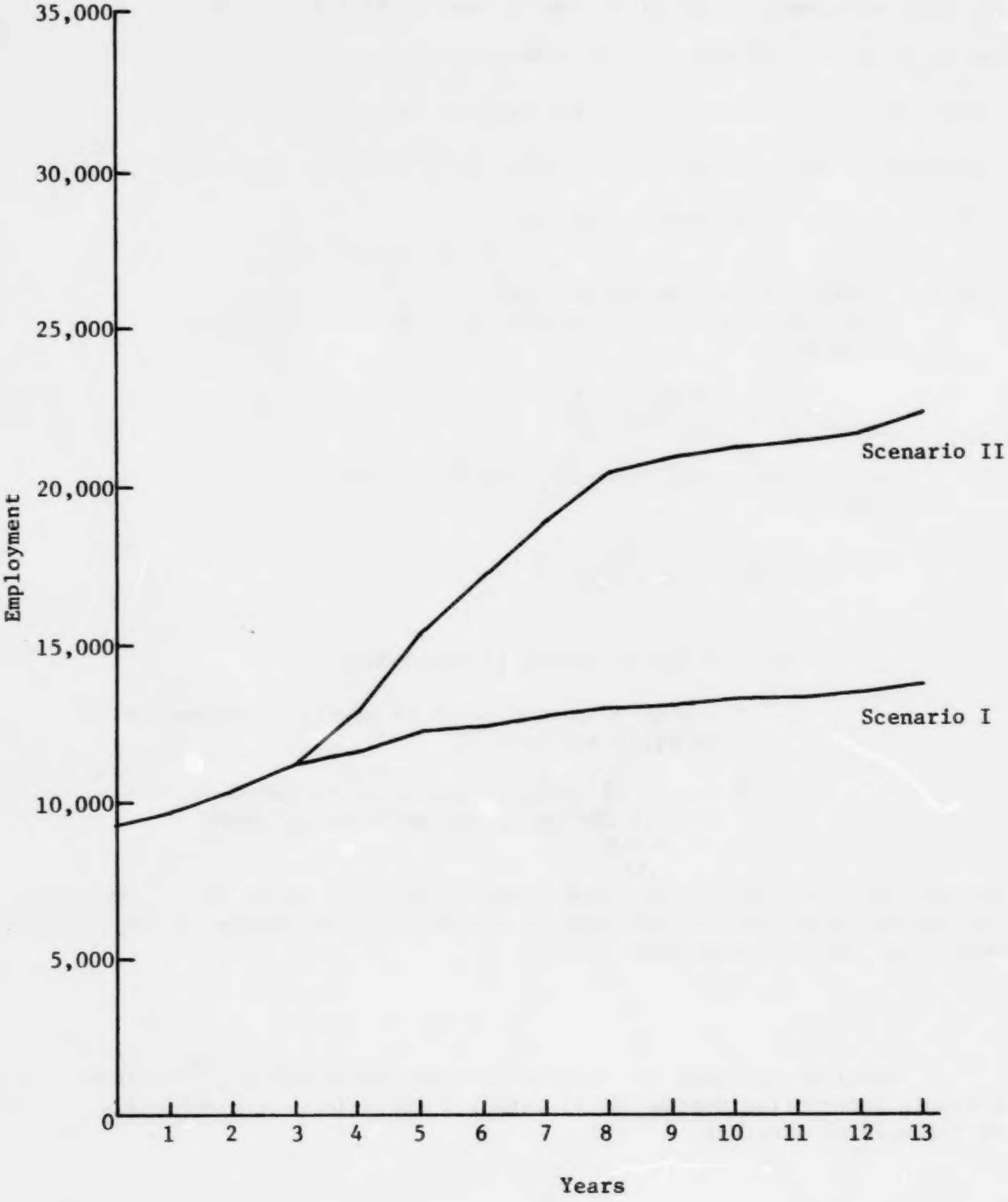
NB = number of nonbasic employees required to provide the goods and services demanded by each C

For the Colorado simulations, both C and NB were set equal to .5. Therefore, the capital construction component of the accelerator equaled $.67\Delta E_t$ and the additional nonbasic component $.33\Delta E_t$.

*Sources included the central Utah impact statement,[12] Regional Economic Information System (REIS) data and interviews with officials in state-level agencies.

EXHIBIT C-2. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, CARBON COUNTY

The Results of Scenarios I and II, Secondary Data



Results--primary case study.* Exhibit C-3 depicts total employment for Carbon County using primary source data for Scenarios I and II. Differences between the two scenarios appear in Year 2 and increase sharply, so that by Year 7, there is a discrepancy of 7,606 workers. While the values for Scenario I level off at this point, those for Scenario II continue to climb, and by Year 13, the gap is a full 9,559. As with the secondary runs, these differences reflect variations in basic energy-related jobs.

Comparison of results and implications. A comparison of the primary and secondary runs for the Utah case study reveals several subtle differences. First, the primary runs begin with a lower total employment level (8,492) than the secondary runs (9,221). The gap between Scenarios I and II begins one year earlier in the primary runs, perhaps indicating a slightly greater sensitivity to change in the energy development patterns. In addition, the ultimate differences in employment levels between the two scenarios is somewhat greater in the primary runs, 9,559 as compared to 8,674. This is largely due to the greater leveling off of Scenario I in the primary runs. Finally, both Scenarios I and II in the secondary runs finish at Year 13 with slightly higher levels than their primary data counterparts.

The discrepancies between the two computer runs would seem to indicate that there is a tendency for analysts using only secondary sources to overestimate total employment. Both start-up and peak years were higher

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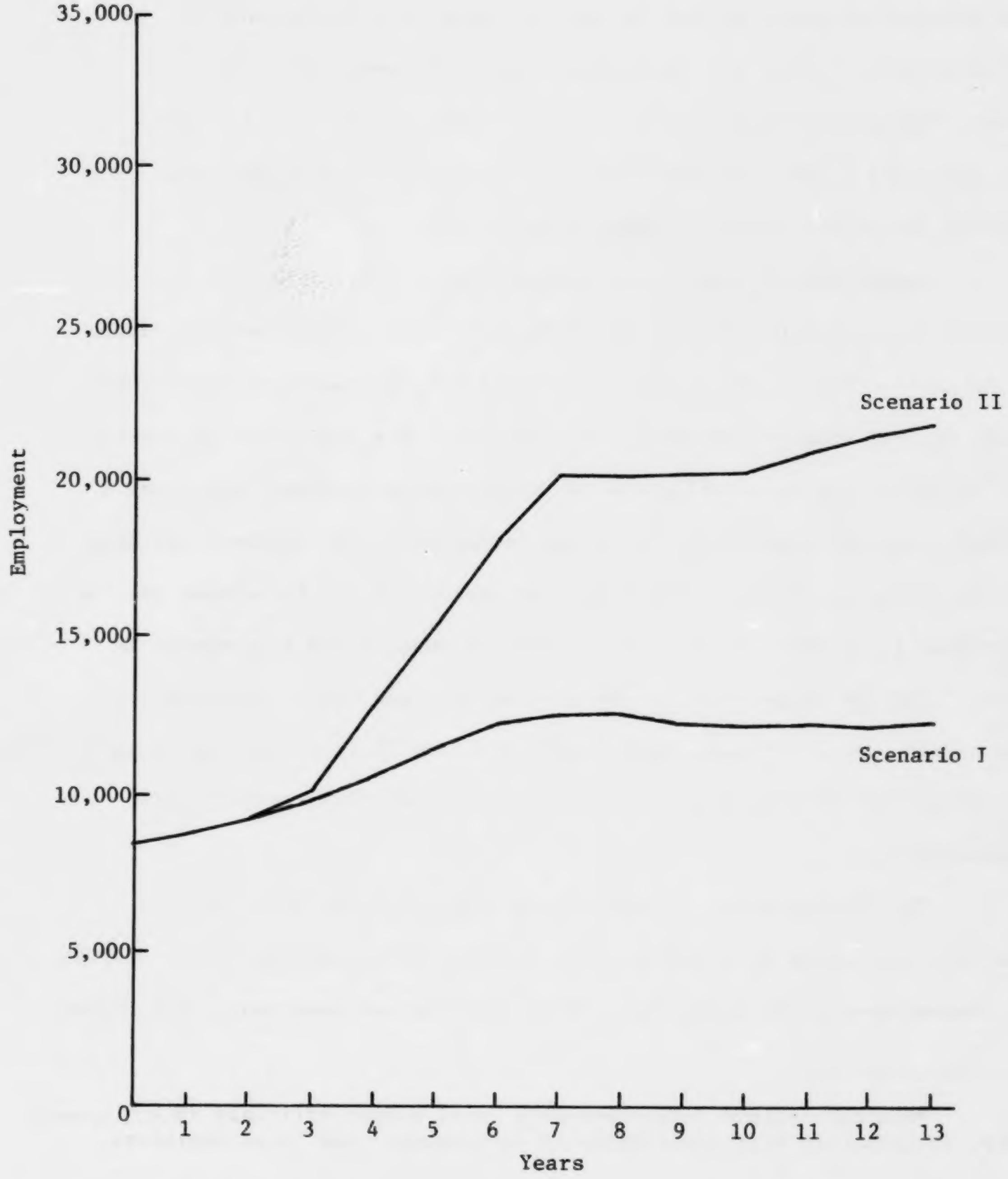
*Sources include interviews with local public officials (e.g., county, city, Southeastern Utah Association of Governments) and local employers.

EXHIBIT C-3. TOTAL (BASIC AND NONBASIC) EMPLOYMENT, CARBON COUNTY

The Results of Scenarios I and II, Primary Data



in the Utah secondary runs than in the primary outputs. Further, there may be an advantage to primary data in terms of sensitivity to change in basic employment levels. This appears to be slightly more important in the Scenario II runs, where variation is the greatest.

Nonetheless, the most critical factors in projecting future total employment would appear to be not sources of data but rather the energy development scenarios themselves and population settlement patterns (see Section A: Description of Energy Development and Section E: Geographic Distribution of Impacts). Variation between the two scenarios and among settlement patterns inputs has a much greater influence upon outputs than do data gathering techniques.

D. Population and Income

Volume II, Section V: Population and Income presents the issues and difficulties involved in estimating population and incomes for a given region. The demonstration methodology described there was used for both primary and secondary runs in the southeastern Utah case study. As noted in Volume II, new total employment is the basis for the model's projections. For a description of how the different components of employment are calculated, see Volume III, Sections A: Description of Energy Development (new basic); B: The Existing Community (baseline); and C: Indirect Economic Activity (nonbasic).

Procedure--Population. The computer model calculates new regional employment for each category: base case basic, energy project operating, temporary construction and nonbasic work forces. These totals are then divided among the jurisdictions within the study area according to previously determined settlement patterns (see Section E: Geographic Distribution of Impacts).

The assumptions concerning family status of workers used in the first step of calculating new population are shown below. The figures are based on previous research done by DRI.

	Head of Household	Living Alone	Nonhead of Household	TOTAL
BASIC EMPLOYEES				
Energy-Related Construction	0.60	0.40	--	1.00
Mining and All Others	0.80	0.10	0.10	1.00
NONBASIC EMPLOYEES	0.60	0.10	0.30	1.00

An example of this first step follows. Given 200 new mining employees in a specific jurisdiction, 160 are assumed to be heads of households 20 to be living alone and 20 to be non-heads of households (i.e., second workers). When the total new heads of households is determined, the new family population is calculated using the following figures.*

	Family Size	School Age Children
Construction	3.59	.92
All Other	3.55	.91

Thus, continuing the above example, the 160 new nonconstruction heads of households would indicate a family population of 568 (160 x 3.55), with a school age population of 146 (160 x .91). The total family population is then added to the singles population to derive the net change in the nonconstruction population over the base year: 588 (568 + 20).

Results--secondary case study** population. Exhibit D-1 displays total population for Carbon County, for both Scenarios I and II, using secondary sources. As shown, the population levels in Scenario I increase gradually and at a fairly steady rate. The change from Year 0 to Year 13 is +10,558. By contrast, the values for Scenario II increase rapidly after Year 3, and the rate of change slows only slightly after Year 8. By Year 13, the increase over Year 0 is 37,107, well over three times the comparable

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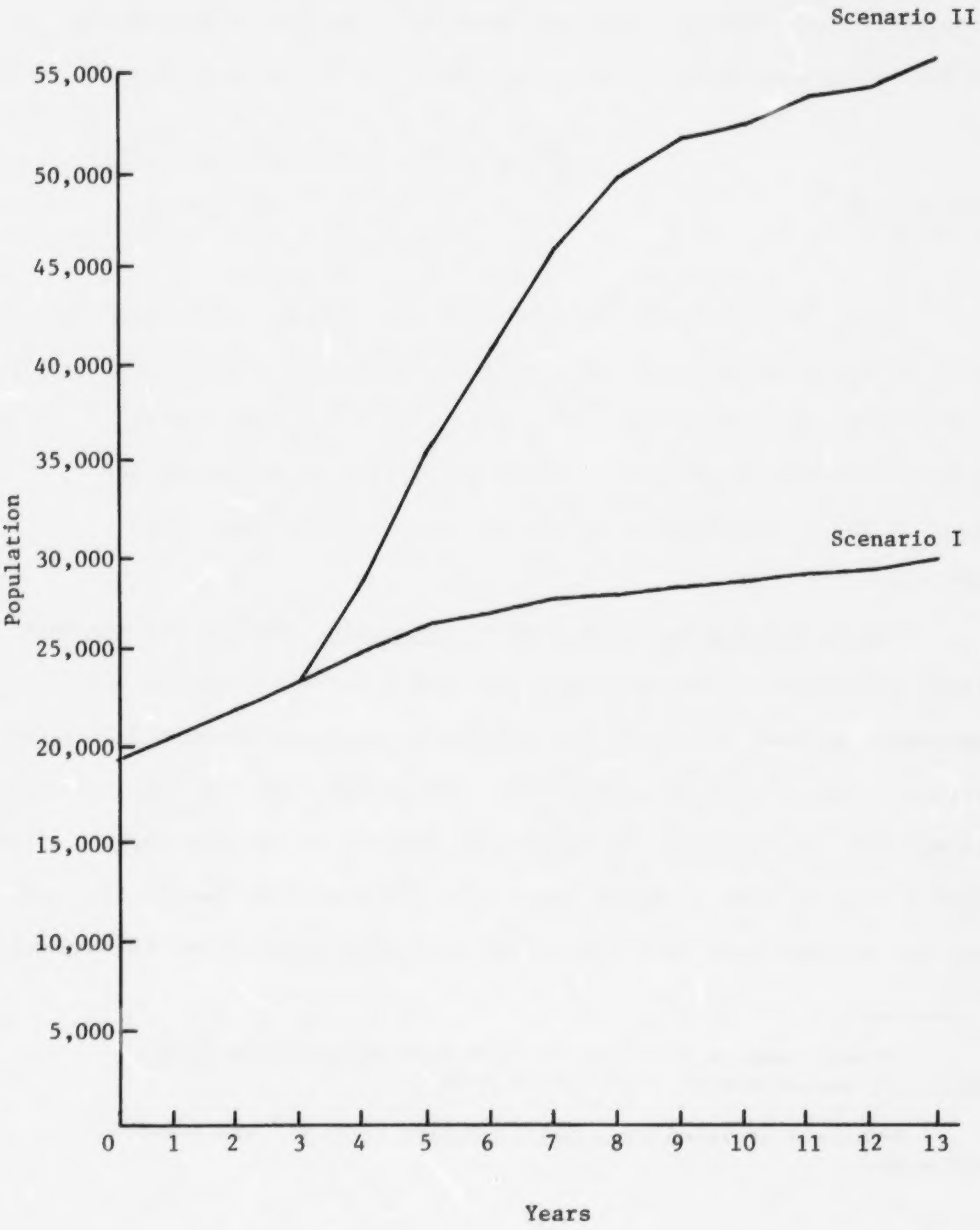
*These numbers are based on data from Construction Worker Profile[13] and knowledge of the study area.

**Sources included Construction Worker Profile[14] and previous DRI work.

EXHIBIT D-1. TOTAL POPULATION, CARBON COUNTY

The Results of Scenarios I and II, Secondary Case Study



change in Scenario I. Because population is dependent upon employment levels, these differences can be attributed to the variance in new basic employment between the two scenarios.

Results--primary case study population.* Exhibit D-2 presents the population forecasts derived with primary data for Carbon County in Scenarios I and II. In this case, the Scenario I values peak in Year 7 at 31,599 and then drop to a Year 13 value of 29,823 with a net gain of 9,323 persons. Scenario II numbers begin to overtake those of Scenario I in Year 2. A sharp rise occurs and peaks also in Year 7 at 48,948. The values level off to Year 10 and then increase fairly rapidly to a final total of 53,509 persons, a net gain of 33,009. Again, as population figures are tied to employment values, the differences between scenarios can be explained as due to different assumptions about energy developments in the three county area.

Comparison of results and implication--population.* The largest discrepancy between the primary and secondary runs for the Utah case study appears to be with Scenario I. In Scenario II, the two curves follow very closely to Year 7, varying essentially by the difference in Year 0 values. At that point, the primary runs dip and end in Year 13 with a value 2,898 below the secondary runs. Conversely, the variance in runs for Scenario I begins in Year 4, widens to a maximum of 3,723 difference

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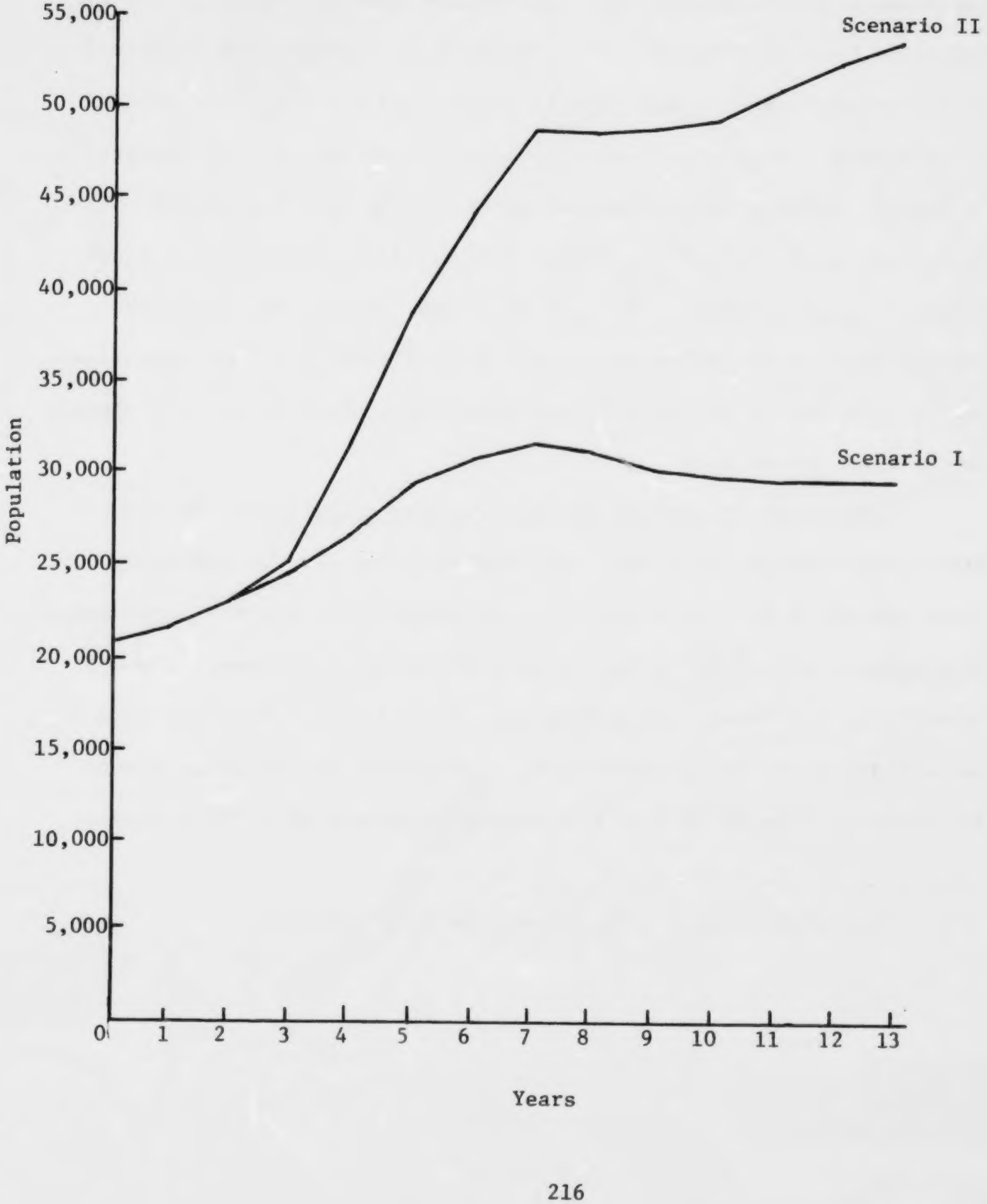
*Secondary sources were reviewed by local officials.

EXHIBIT D-2. TOTAL POPULATION, CARBON COUNTY

The Results of Scenarios I and II, Primary Case Study



in Year 7. The difference all but disappears by Year 13 (35 persons). Finally, because portions of the curves for the primary data runs appear to be "departures" from those of the secondary runs (for Scenario I: Years 4-10; for Scenario II: Years 7-13ff), the primary outputs seem to take into account factors which the secondary sources ignore. For example, the main data source for the secondary case study employment did not include temporary construction workers, however, they were included in the primary case study. (See Section A: Description of Energy Development.)

Because expansions of community services and facilities are often planned on the basis of population projections, such forecasts are important parts of impact assessments. However, two factors need to be considered when developing and interpreting population estimates. The first is the generally high level of uncertainty with regard to industry development plans themselves (see Section A: Description of Energy Development). The second is the quality and sources of data. As exemplified in the Utah case study runs, a significant difference under both scenarios prevails. Heavy reliance on secondary sources and/or projecting too far into the future could result in under or over building of facilities. Thus, population forecasts should be taken as indications of possible futures, given a particular energy development scenario, and not as an absolute certainty.

Procedure--income. As described in Volume II, incomes are determined in the model for use in evaluating effective housing demand and in assessing the income-related impacts of energy development (e.g., sales tax revenues). An average annual income per employee for the base year (1977) in each of ten employment categories is supplied. Regional Economic Information System (REIS) data were examined but were inadequate in some cases, because the Employment and Personal Income tables did not fully correspond.* Supplementary information was therefore sought from 1970 Census data and from the Research and Analysis Section of the Utah Department of Job Service. The results are shown in Exhibit D-3. These incomes were adjusted for an annual productivity increase (3 percent) in the model, but no adjustment was made for inflation.

In estimating total personal income in Carbon County, REIS data for 1975 were used to determine the relationships between the various components of personal income, for example, proprietor's income, other labor income, and wage and salary income. These relationships were then judgmentally adjusted based on the analyst's previous knowledge of the area. All components of income are in 1977 dollars. An example of the computations and assumptions used in estimating total personal and per capita income for Scenario II--primary case study--is presented below.

Year 2.

1.113	Population ratio--population in Year 2 was compared to population in Year 0 (22,807 ÷ 20,500 = 1.113)

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*The Employment Table has wage and salary employment only and the total Personal Income Table included proprietors and employees. DRI was advised not to use employment numbers to determine an average wage because of the possibility of a severe error especially in Services, Trade and Finance, Insurance and Real Estate (FIRE) categories.

EXHIBIT D-3. AVERAGE ANNUAL INCOME IN 1977 DOLLARS PER EMPLOYEE FOR THE THREE COUNTY AREA, 1977

	Carbon	Emery	Grand	Nonbasic Workers Average	Basic Workers Average
Agriculture	$ 8,490	$ 8,994	$ 8,354	$ 8,613	$ 8,613
Manufacturing	9,254	9,817	6,152	8,408	8,408
Mining	18,390	16,676	13,076	16,047	18,390
Construction	12,134	23,037	17,801	17,657	24,000 (power plant construction workers) 17,801 (all other energy-related construction workers)
T. C. & U.	15,249	14,149	13,665	14,351	18,390 (power plant operating workers)
Services	5,733	5,720	5,249	5,567	5,567
Federal Government	20,954	16,797	16,311	18,021	18,021
State and Local Government	8,281	7,815	8,864	8,320	8,320
Wholesale and Retail Trade	6,950	6,492	7,710	7,051	7,051
F.I.R.E.	8,142	6,532	8,089	7,588	7,588

Sources: U.S. Department of Commerce, Regional Economic Information System (1971, 1975); Bureau of the Census (1970); and Utah State Job Service, Statistical Division.

x $35,249,100	Total of nonfarm proprietor's income + other labor income + dividends, interest, and rent + transfer payments - personal contributions for social insurance adjusted to 1977 dollars.
+ $13,013,000	Wage and salary income for Year 2 from computer printout.
+ $62,596,400	The wage and salary components of personal income from the 1975 REIS data, adjusted to 1977 dollars and by an annual productivity factor of 3 percent.
+ $10,609,000	The place of residence adjustment from the 1975 REIS data increased to reflect the energy-related employment growth which happened between 1975 and 1977. The increase reflects the assumption that some Emery County employees will be living in Carbon County until such time as Emery develops its housing and public facilities/services capacities. The residence adjustment factor is increased by an annual productivity gain of 3 percent.
= $129,262,700	Estimated total personal income in Carbon County, under Scenario II, Primary case study, Year 2 of the forecast period.
÷ 22,807	Population in Carbon County under Scenario II, Primary case study from computer printout.
= $5,668	Estimated per capita income in Carbon County under Scenario II, Primary case study, Year 2 of the forecast period.

Results--secondary case study income. Exhibit D-4 displays the results of the demonstration methodology for per capita income using secondary data. As shown, both Scenarios I and II produce per capita income levels well above the base case.* In Year 1, the difference is

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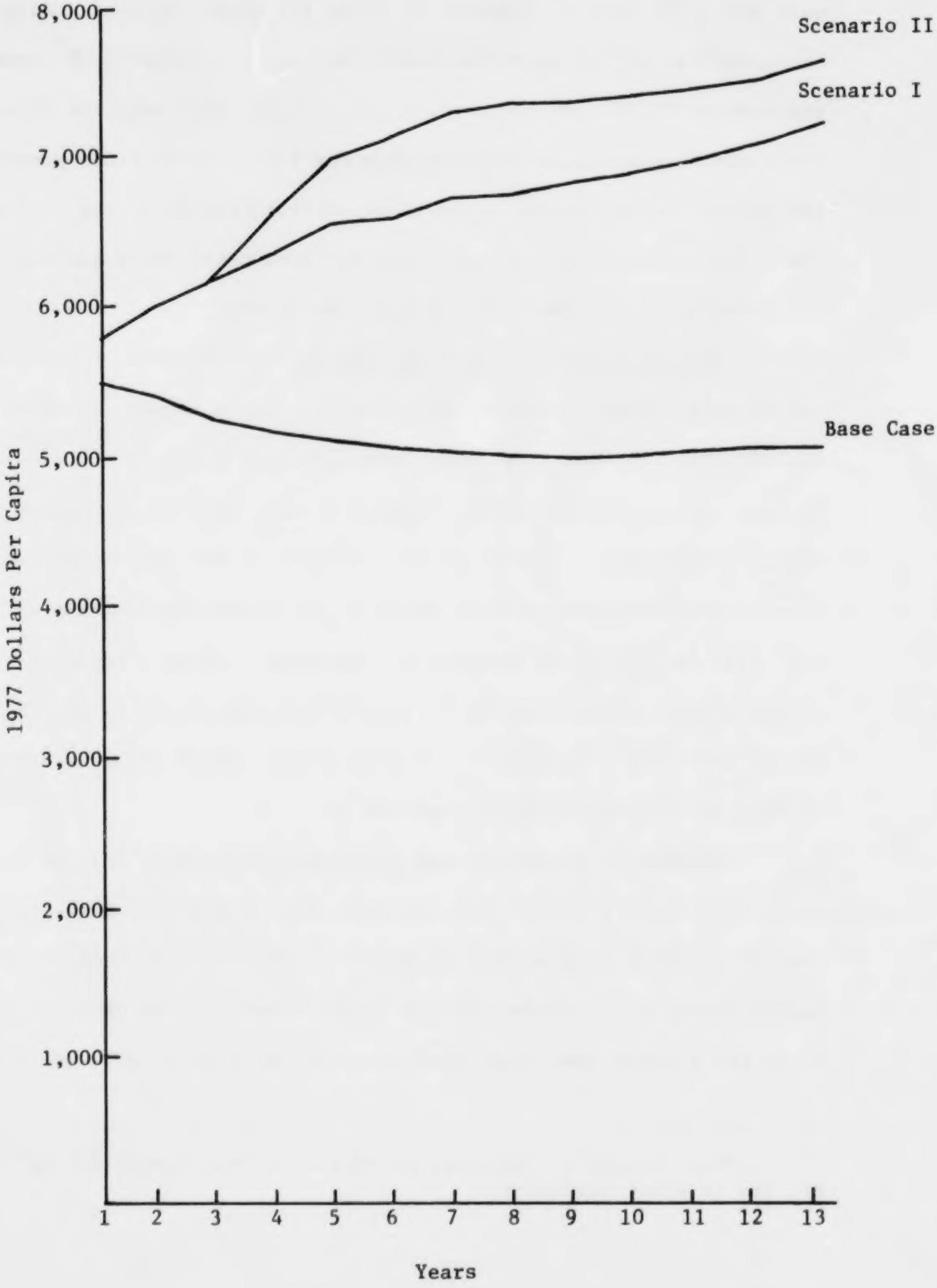
*For an explanation of base case conditions, see Section B: The Existing Community.

EXHIBIT D-4. PER CAPITA INCOME, CARBON COUNTY, SECONDARY CASE STUDY

The Results of Scenarios I and II



only $281. By Year 8, Scenario II is $2,375 above the base, while Scenario I is $1,758 above the base. In Year 13, Scenario II surpasses the base by $2,564; and Scenario I has a $2,161 gain over the base. Thus, while the base declines slightly over the time period, rapid growth in per capita income occurs. This is especially true in Scenario II during the Years 4 through 8, but generally for both cases where additional energy-related employment is added to the county.

Results--primary case study income. The results of Scenarios I and II using primary data to calculate per capita income are shown in Exhibit D-5. In this case study, the base case displays a gradual increase in per capita income although it continues to fall below both energy development scenario levels. In Year 1, the base is merely $143 less. At the peak--Year 7--it falls $1,667 below the Scenario II values and $935 below that of Scenario I. Scenario I shows a tendency for steady growth, where Scenario II incurs rapid increases in per capita income from Year 3 to Year 7. At this point, income actually declines to Year 10, rising gradually thereafter.

Comparison of results and implication--income. Because base case employment and population both increase more in the secondary case study than the primary case study,* it might be expected that changes in per capita income would follow similar lines. However, the opposite is true, the primary case study projects a steady slow economic growth

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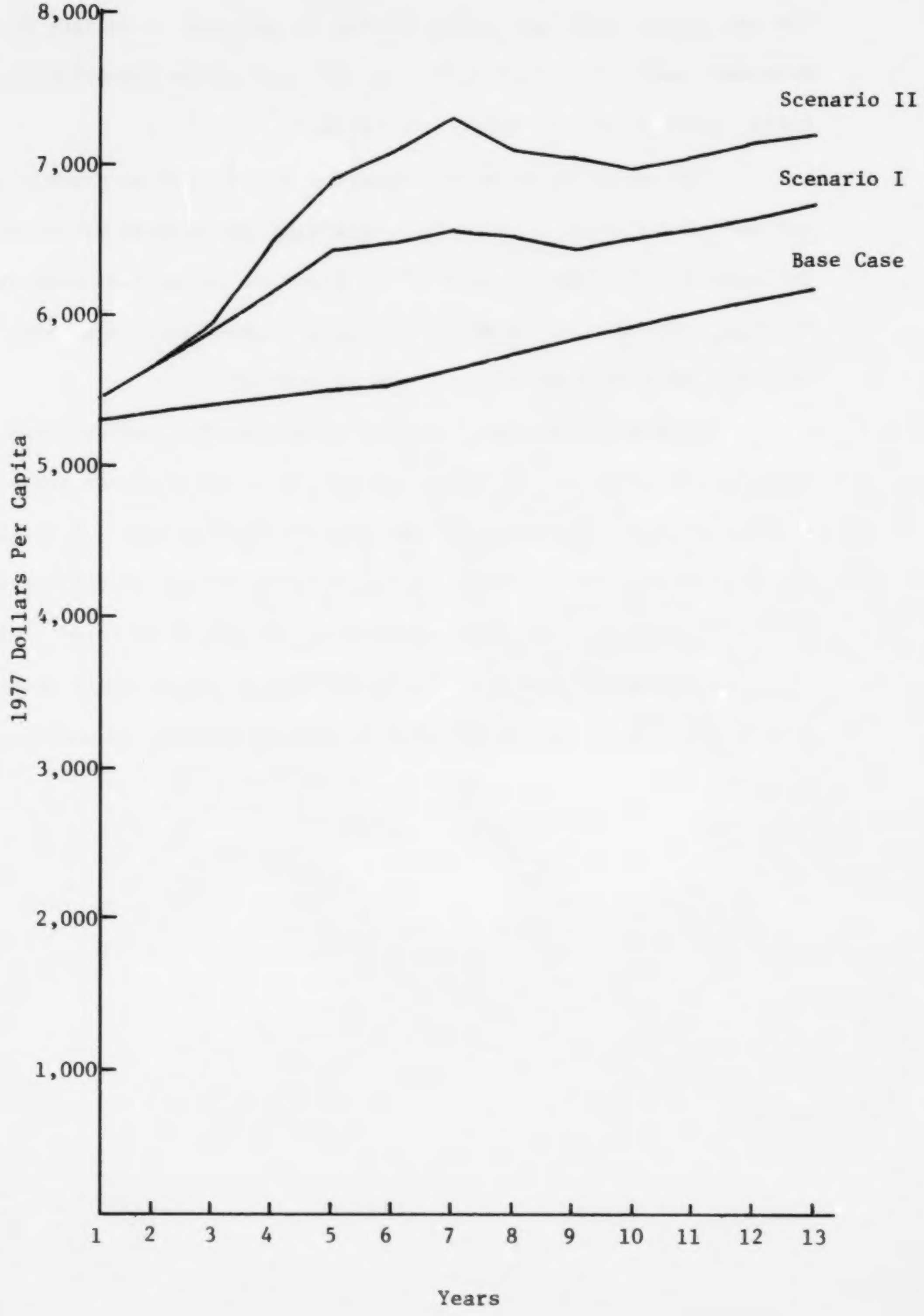
*See Section A: Description of Energy Development and Section B: The Existing Community.

EXHIBIT D-5. PER CAPITA INCOME, CARBON COUNTY, PRIMARY CASE STUDY

The Results of Scenarios I and II



for the county while per capita income is presumed to decline in the secondary analysis. This occurs because population rises faster than total income in the secondary case study.

The energy development scenarios do not vary as greatly with the use of different data sources, although the greater sensitivity to peaks and declines in activity is found in the primary case study. Finally, the differences among all three income levels are less, and also more constant with the use of primary data.

As will be discussed further in Section H: Sociocultural Impacts, the rise in per capita incomes as a result of the introduction of energy developments has several implications. Perhaps the most significant of these is the positive effect of the increase in buying power for the local residents. It should be noted, however, that the incidence of a local inflation factor due to rapid population growth needs to be considered when evaluating impacts on personal incomes.

E. Geographic Distribution of Impacts

Volume II, Section VI: Geographic Distribution of Impacts presents the demonstration methodology used in the distribution of employees. A number of factors need to be considered in this process, including: commuting time to the project site, transportation network, amenities offered in a community, availability of preferred housing, location of trade and service sector jobs, and the communities' dispositions towards growth and development. These were utilized in both Utah case studies; the difference was in the level of detail and timeliness of available information.

Separate settlement patterns were specified for (1) new base case basic employees; (2) temporary and operating employees from each new basic energy facility; and (3) new nonbasic employees. In addition, the counties in which base case nonbasic employment would occur were detailed. Distribution assumptions were made for every area or political jurisdiction for which population estimates and/or public finance analyses were required.

Procedure--secondary case study. The geographic allocations were derived judgmentally based on earlier site visits (late 1975 and early 1976) in conjunction with DRI's analysis (from secondary sources, i.e., maps) of the area's location factors mentioned above. Exhibit E-1 gives the assumption used to locate the new base case basic employees.*

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*Because of the way in which the scenarios and base case were handled this included some new energy workers (see Section A: Description of Energy Development).

EXHIBIT E-1. BASIC RELATED POPULATION DISTRIBUTION (FRACTION)

Counties of Employment	Counties of Residence				
	Carbon	Emery	Grand	Price	Carbon School District
Carbon	1.00	0.00	0.00	0.90	1.00
Emery	0.03	0.97	0.00	0.03	0.03
Grand	0.00	0.00	1.00	0.00	0.00

It was assumed that all new Carbon County basic employees would reside in that county because it is the regional trade center and tends to attract a large portion of the two counties' population (Carbon and Emery). It was then assumed that 90 percent would live in Price, for the reasons presented above. The school district and county boundaries are coterminous; therefore, every worker in Carbon County also resides within the school district.

The same thing holds true for Grand County. The largest community and the one where most of the employment increase would take place (Moab) is in the south central part of the county, far from the other counties. The transportation network is such that the employees would probably live in Grand rather than in any neighboring county. Most of Emery County's new basic employees were assumed to live where they work. However, because of the closeness and attractiveness of Price, a small portion (3 percent) were projected to live in Carbon County.

The basis for the settlement patterns for new energy-related employees was the location of the developments in relation to the transportation network and their proximity to the various communities (especially Price). Carbon County and Price were assumed to attract a significant number of workers whenever the road system would allow for a relatively easy commute. Exhibit E-2 gives the assumption used for the coal mines and power plants. The computer model allows for separate input assumptions for temporary and permanent employees on each project. Therefore, inputs were provided where temporary employment was known.*

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*Because of the USGS's decision not to include temporary construction workers for the mines (see Section A: Description of the Energy Development), these inputs were provided only for the Emery Power Plant.

EXHIBIT E-2
POPULATION DISTRIBUTION RESULTING FROM PERMANENT NEW BASIC EMPLOYMENT

Location of Basic Employment	Carbon County	Emery County	Grand County	Sevier County	Price County	Carbon S.D.
Mine 1	1.00	.00	.00	.00	.70	1.00
Mine 2	.80	.20	.00	.00	.90	1.00
Mine 3	.60	.40	.00	.00	.50	1.00
Mine 4	.20	.80	.00	.00	1.00	1.00
Mine 5	.00	.00	.00	1.00	.00	.00
Mine 6	.10	.90	.00	.00	1.00	1.00
Mine 7	.10	.90	.00	.00	1.00	1.00
Mine 8	.00	.10	.00	.90	.00	.00
Mine 9	1.00	.00	.00	.00	.60	1.00
Mine 10	.70	.30	.00	.00	.70	1.00
Mine 11	.55	.45	.00	.00	.50	1.00
Mine 12	.98	.02	.00	.00	1.00	1.00
Mine 13	.98	.02	.00	.00	1.00	1.00
Mine 14	.00	.15	.00	.85	.00	.00
Emery Units 1&2	.20	.80	.00	.00	1.00	1.00
Emery Units 3&4	.15	.85	.00	.00	1.00	1.00

POPULATION DISTRIBUTION RESULTING FROM TEMPORARY NEW BASIC EMPLOYMENT

Location of Basic Employment	Carbon County	Emery County	Grand County	Sevier County	Price County	Carbon S.D.
Emery Units 1&2	.50	.50	.00	.00	1.00	1.00
Emery Units 3&4	.30	.70	.00	.00	1.00	1.00

EXHIBIT E-3. NONBASIC INCREMENTAL EMPLOYMENT DUE TO BASE CASE BASIC EMPLOYMENT (DISTRIBUTION FRACTIONS)

		Counties of Nonbasic Employment		
		Carbon	Emery	Grand
Counties of Basic Employment	Carbon	0.94	0.06	0.00
	Emery	0.66	0.34	0.00
	Grand	0.00	0.00	1.00

EXHIBIT E-4. NONBASIC POPULATION DISTRIBUTION (BASE CASE, INCREMENTAL)

		Counties of Residence				
		Carbon	Emery	Grand	Price	Carbon School District
Counties of Employment	Carbon	1.00	0.00	0.00	0.95	1.00
	Emery	0.03	0.97	0.00	0.03	0.03
	Grand	0.00	0.00	1.00	0.00	0.00

EXHIBIT E-5. TOTAL POPULATION BY JURISDICTION
UTAH SECONDARY CASE STUDY, SCENARIO I

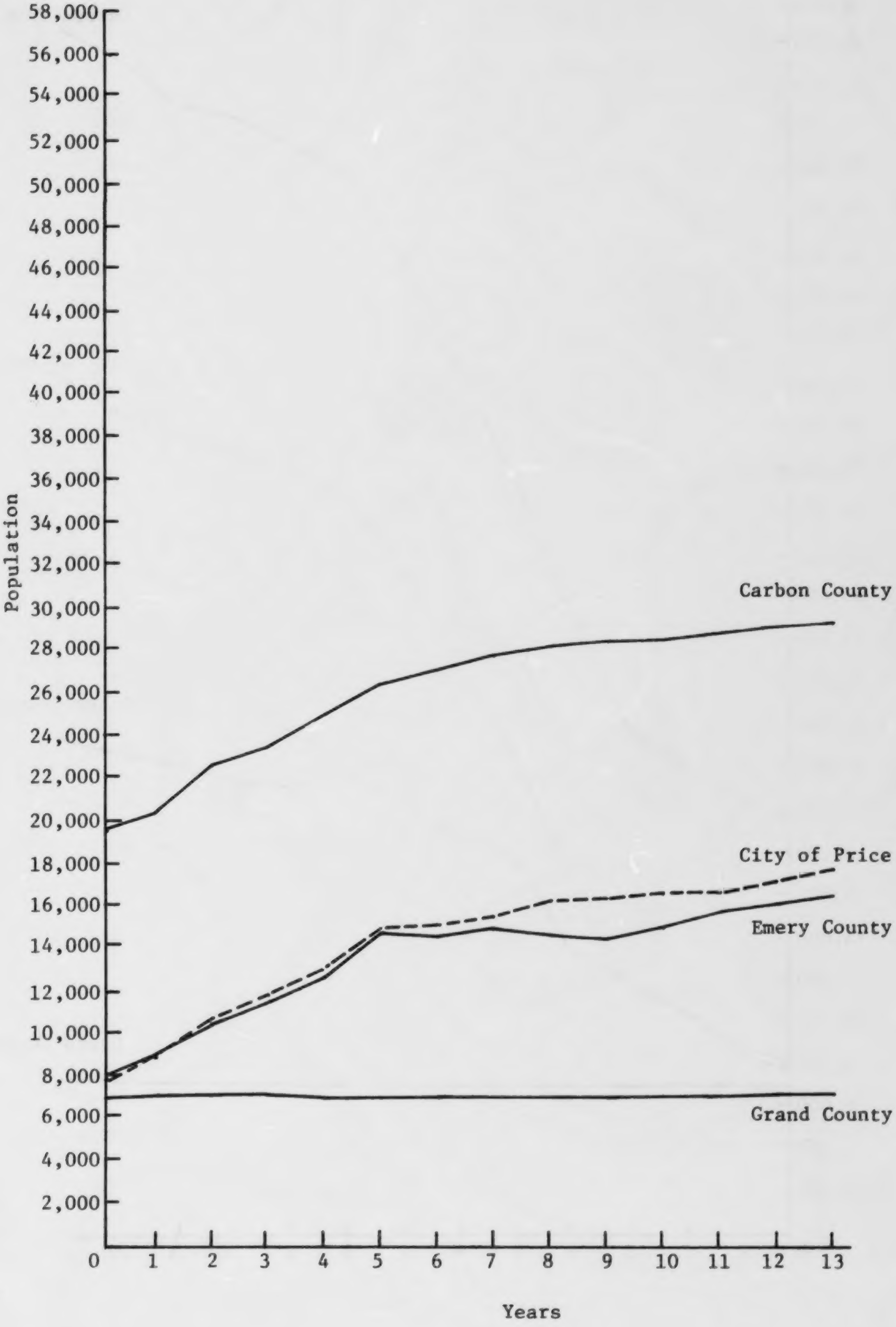
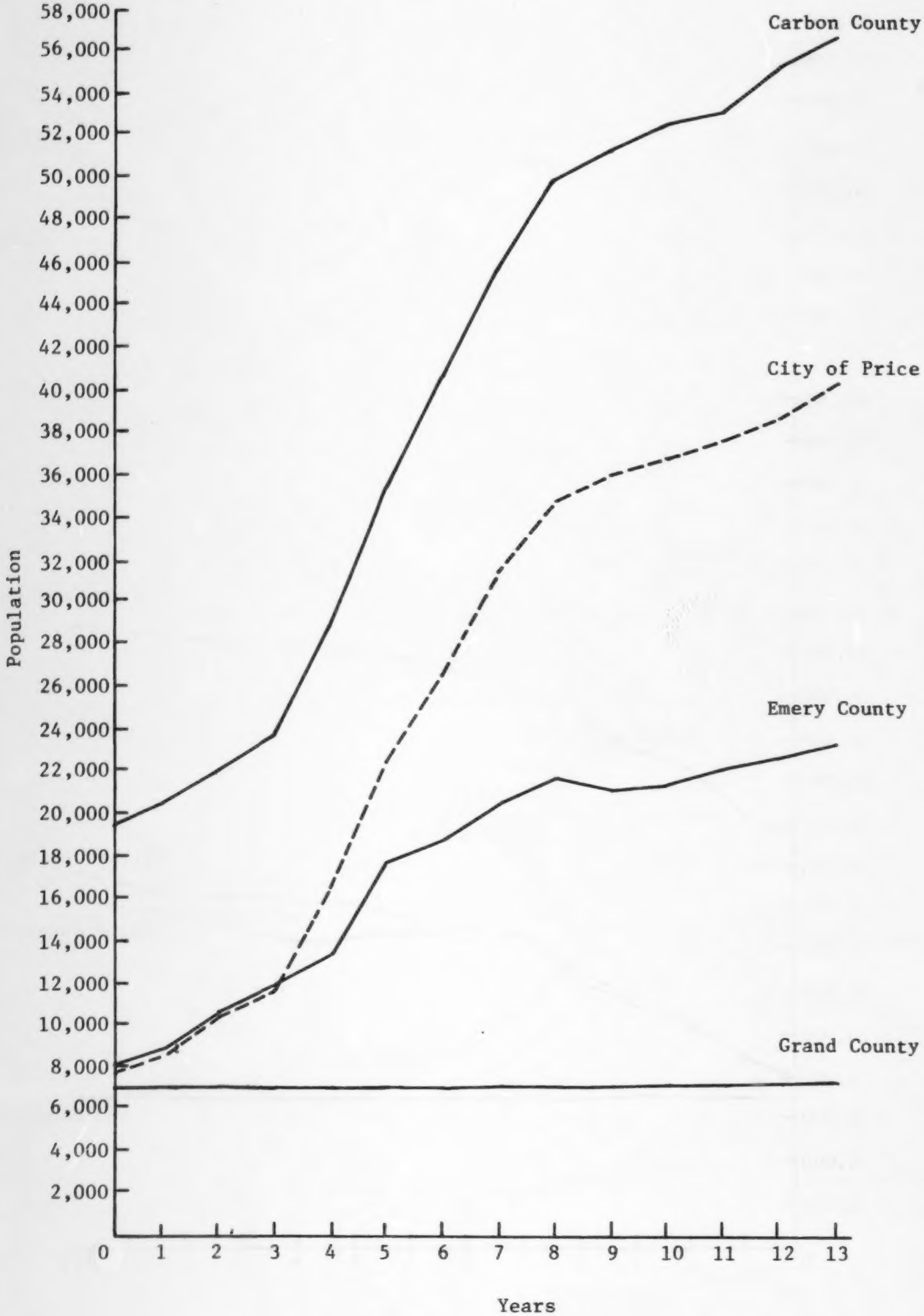


EXHIBIT E-6. TOTAL POPULATION BY JURISDICTION

UTAH SECONDARY CASE STUDY, SCENARIO II



As a result of Price's relationship as regional trade center to both Carbon and Emery Counties, it was assumed that a large portion of the nonbasic employment associated with base case basic employment in these counties would occur in that city. Exhibit E-3 gives these percentages. All of the nonbasic employment generated by the base case basic jobs in Grand County was expected to take place there. This assumption was based on Grand County's (and especially the City of Moab's) relative isolation from the other two counties.

Exhibit E-4 presents the assumed settlement patterns of new nonbasic workers (those generated by the new energy-related basic employment) relative to where they work. These are the same as those used in Exhibit E-1 (New Basic Employees, Base Case) with one exception: Price was expected to receive 95 percent of Carbon County's nonbasic population, but only 90 percent of the new basic employees.

Results--secondary case study. The allocation of regional population growth among the three counties and Price under Scenario I is shown in Exhibit E-5. Exhibit E-6 illustrates the same thing under Scenario II. In both Scenario I and II Carbon County will receive the largest number of new residents (10,588 and 37,107, respectively). Price's curve parallels that almost exactly, with an increase of 9,906 (I) and 32,352 (II). Emery County also has substantial growth, with 8,466 new people under the first scenario and 15,128 under the second. Grand County remains fairly stable under both scenarios, increasing only by 220.

Procedure--primary case study. In this phase the geographic distributions were derived judgmentally based on interviews with local officials and industry representatives, on a worker distribution survey by place of residence and place of work* and on a more in-depth analysis of the location factors mentioned at the beginning of this section. Exhibit E-7 corresponds to Exhibit E-1. The distribution of new base case basic employees remained the same for Carbon and Grand Counties. However, it was found that more Emery County employees live in Carbon County than was originally thought; therefore, the distribution was changed from 3 percent to 50 percent residing in Carbon County.**

During the interviews, energy representatives were asked where their present employees live and what might be projected for the future. These results, along with those from the Utah Department of Transportation survey, were the basis for determining the settlement patterns for new energy-related employees. Exhibit E-8 gives the assumptions used for distributing the temporary construction workers. The allocation of the permanent operating work force is shown in Exhibit E-9.

As was the case with the secondary case study, Price was still considered to attract a large portion of the nonbasic employment generated in Carbon and Emery Counties. The percentages were changed somewhat (Carbon went from 94 percent to 90 percent and Emery from 66 percent to 60 percent), but the same trend remained. Again, all of the nonbasic employment associated with Grand County's base case basic jobs was expected to occur there. (See Exhibits E-10 and E-3.)

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*This study was not discovered until the personal interview phase of the primary case study.[15]

**Price, as part of the Price River Water Improvement District, has excess capacity in its water and sewage systems, whereas these are presently constraining factors for growth in Emery County (see Section G: Housing).

EXHIBIT E-7. BASIC RELATED POPULATION DISTRIBUTION (FRACTION)

Counties of Employment	Counties of Residence: Carbon	Emery	Grand	Price	Carbon School District
Carbon	1.00	0.00	0.00	0.90	1.00
Emery	0.50	0.50	0.00	0.45	0.50
Grand	0.00	0.00	1.00	0.00	0.00

EXHIBIT E-8
POPULATION DISTRIBUTION RESULTING FROM TEMPORARY NEW BASIC EMPLOYMENT

Location of Basic Employment	Carbon County	Emery County	Grand County	Other	City of Price	Carbon S.D.
Coastal States Energy	.50	--	--	.50	.90	1.00
Swisher	.70		--	.30	.90	1.00
Pacific Gas & Electric	.70	--		.30	.80	1.00
American Coal Company	.40	.50	--	.10	.90	1.00
IPP Mines--Carbon County	.70	--	--	.30	.80	1.00
IPP Mines--Emery County	.40	.50	--	.10	.90	1.00
Atlas Uranium Mill	--	--	.90	.10	--	--
UP&L Emery Units 1 & 2	.40	.50	--	.10	.90	1.00
UP&L Emery Units 3 & 4	.40	.50	--	.10	.90	1.00
UP&L Wellington Units 1 & 2	.75	.15	--	.10	.85	1.00

EXHIBIT E-9
POPULATION DISTRIBUTION RESULTING FROM PERMANENT NEW BASIC EMPLOYMENT

Location of Basic Employment	Carbon County	Emery County	Grand County	Other	City of Price	Carbon S.D.
Trail Mountain Mine	.15	.85	--	--	1.00	1.00
Soldier Creek	.30	.70	--	--	.90	1.00
AMCA Coal Leasing	.60	.10	--	.30	.70	1.00
Coastal States Energy	.50	.30		.20	.80	1.00
Consolidation Coal Company	.20	.45		.35	1.00	1.00
Plateau Mining Company	.80	.20	--	--	.90	1.00
Swisher	.75	.20	--	.05	.90	1.00
Valley Camp	.80	--	--	.20	.75	1.00
U.S. Fuel	.80	.20	--	--	.90	1.00
American Coal Company (both scenarios)	.35	.55	--	.10	.95	1.00
Pacific Gas & Electric	.85	.15	--	--	.75	1.00
IPP Mines--Carbon County	.85	.10	--	.05	.90	1.00
IPP Mines--Emery County	.60	.40	--	--	.90	1.00
Union Carbide Uranium Mine	--	--	1.00	--	--	--
Atlas Uranium Mill	--	--	1.00	--	--	--
UP&L Emery Units 1 & 2	.50	.50	--	--	.95	1.00
UP&L Emery Units 3 & 4	.40	.60	--	--	.95	1.00
UP&L Wellington Units 1 & 2	1.00	--	--	--	.75	1.00

EXHIBIT E-10. NONBASIC INCREMENTAL EMPLOYMENT DUE TO BASE CASE BASIC EMPLOYMENT (DISTRIBUTION FRACTIONS)

		Counties of Nonbasic Employment		
		Carbon	Emery	Grand
Counties of Basic Employment	Carbon	0.90	0.10	0.00
	Emery	0.60	0.40	0.00
	Grand	0.00	0.00	1.00

Exhibit E-11 corresponds to Exhibit E-4. Some of the assumed settlement patterns for new nonbasic workers (those generated by the new energy-related employment) were changed based on updated knowledge of the area. All Carbon County nonbasic employess will still reside in Carbon County, but fewer will live in Price. Also, all Emery County's nonbasic employees will live where they work. Grand County was not altered.

Results--primary case study. Exhibits E-12 and E-13 illustrate the allocation of regional population growth among the three counties and the City of Price under Scenarios I and II, respectively. Again, in both scenarios, Carbon County and Price have the largest increases in population. In the first scenario, Carbon County gains 11,099 people from Year 0 to Year 7 (the peak construction year), while Price increases 10,617. But as construction workers leave the area, the county's net gain decreases to 9,323 and the city's to 9,341. In Scenario II, Carbon County's population increases 33,009 by Year 13 and Price's population by 30,446.

Emery County also receives substantial increases; by Year 5 in Scenario I, there are about 6,000 more people. As construction crews leave the area, the net increase by Year 13 drops to 3,098. In the high development scenario, that county's population increases by 8,689. As before, Grand County's population level remains relatively stable with an increase in both scenarios of 731.

Comparison of results and implications. In all scenarios, Carbon County and Price receive the largest increases in population. In both

EXHIBIT E-11. NONBASIC POPULATION DISTRIBUTION (BASE CASE, INCREMENTAL)

		Counties of Residence				
		Carbon	Emery	Grand	Price	Carbon School District
Counties of Employment	Carbon	1.00	0.00	0.00	0.80	1.00
	Emery	0.15	0.85	0.00	0.10	0.15
	Grand	0.00	0.00	1.00	0.00	0.00

EXHIBIT E-12. TOTAL POPULATION BY JURISDICTION
UTAH PRIMARY CASE STUDY, SCENARIO I

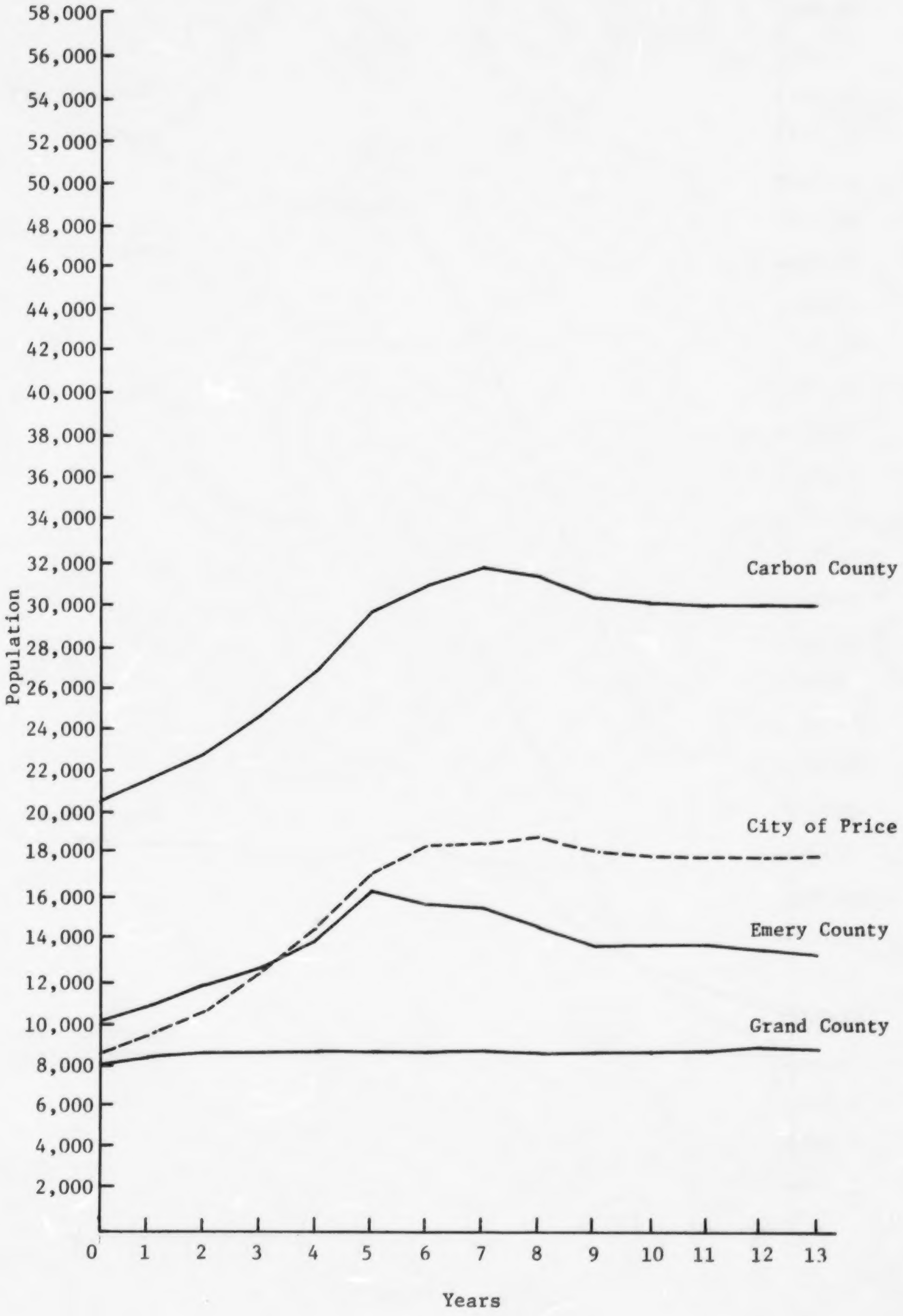
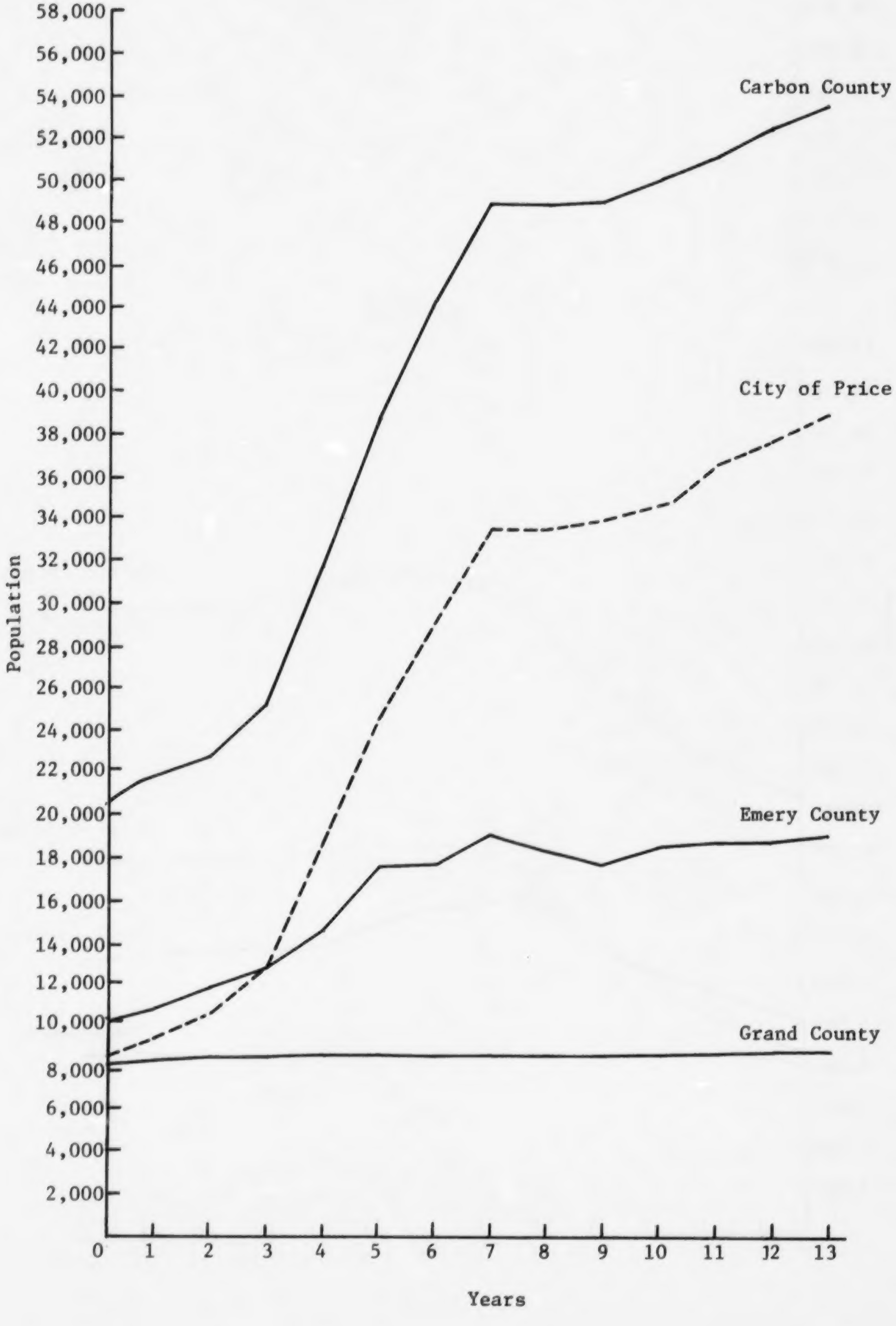


EXHIBIT E-13. TOTAL POPULATION BY JURISDICTION
UTAH PRIMARY CASE STUDY, SCENARIO II



case studies, the percentage of the county population living in Price is higher in Scenario I than Scenario II. Shifts also occur in the amount of regional impacts that Emery County receives. In the first scenario of the secondary run, Emery County receives 44 percent of the total new population for the region. This decreases in Scenario II to 29 percent. The decrease was due to the fact that more mines were located in Carbon County in this scenario than the first. In the primary case study Emery County receives 26 percent (Scenario I), and 20 percent (Scenario II) of the total population. This again is due to location of new energy developments.

It is difficult to make many comparisons between the two case studies because different development scenarios were used. However, having access to primary sources such as personal interviews did allow for the use of more current information and thus produced results that are more accurate.

In general, population growth is affected more by the development scenarios than by the distribution patterns. However, when using this assessment methodology in cases where a substantial amount of energy development could be taking place more than an hour's commuting time from an established regional trade center, it might be wise to run some sensitivity analyses using different distribution patterns. For example, assumptions could be made that commuting patterns would change substantially, thus creating more growth in Emery County. This would allow a means of comparing not only the population impacts, but also the fiscal impacts of different alternatives.

F. Public Finance

Volume II, Section VII: Public Finance describes the fiscal analysis phase of the demonstration methodology. The most recent available budgets were used to determine the sources and magnitudes of revenues and operating expenditures by jurisdiction. A threshold approach was used where capital costs were derived from standardized sources and supplemented by interviews with local officials.

Carbon County's sound financial status is due to conservative fiscal management practices. The mill levy has remained relatively stable in recent years (down from 16.60 in 1977 to 16 in 1978).* The county has an excess bonding capacity and their one outstanding bond issue will be paid off in 1980. A large part of their revenues comes from ad valorem taxes, federal transfers and fees and service charges.

Price's financial officer, P. Hampton McArthur, recently conducted an informal survey of per capita costs of government. Price had a much higher expenditure rate than other communities of comparable size. This is because Price provides a higher level of services to the local population, including providing library service for the entire county.** Due to an increased demand for services, the city's mill levy went from 12 to 17 mills this year. At present Price has no bonded indebtedness. The largest source of revenue is utilities service charges, followed by sales tax receipts and property taxes.

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*The mill levy is expected to drop drastically next year because of the property reevaluation that is presently occurring in the county.

**Interview with P. Hampton McArthur, September 1978.

Carbon County School District's boundaries are coterminous with those of the county. The district's enrollment has been increasing since 1975 (for 1977-78 it was 4,341). More than one-half of the school district's revenues come from the Minimum School Program.* The next two largest sources are other transfers from the state and ad valorem tax receipts. The district also receives funds from P.L. 81-874. Because of increasing assessed valuation, the mill levy has remained fairly constant (52.330 in 1976 and 51.79 in 1977).

Procedure--secondary case study. The following section presents the steps taken to implement the fiscal assessment process using secondary data for Carbon County, Price and the Carbon County School District. All future rate assumptions for revenues and operating expenditures were based on DRI's judgment. Secondary sources along with analogous situations in other boom communities were used for the capital expenditure projections.

Revenue projections. Principle revenue categories were determined by examining audit statements for the county, city and school district's annual report.** These categories are shown on Exhibits F-1, F-2, and F-3. Residential assessed valuation was computed using estimated prices for four prototypes (i.e., single family unit, multi-family unit, and mobile home). The latest assessment rate available from a secondary source

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*For purposes of the analysis the local ad valorem revenues raised for the Minimum School Program have been included in that category.

**City (1976-77) and county (1976) audit statements were available from the Utah State Auditor and the school district's annual report (1976-77) from the Utah State Board of Education. Population estimates used were the best available from secondary sources.

1976 Budget
Population = 19,300
(76 est.)

EXHIBIT F-1. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES

County of Carbon	Calendar Year 1976 Total Revenue[a]	Calendar Year 1976 Rate Basis	Future Rate Basis	Comments/Explanations
Operating revenues: Ad Valorem Taxes	$813,193	NA	New residential assessed valuation at: $7,000 per single family unit $3,600 per multi-family unit $2,600 per mobile home and "other" unit	
General Use and Sales Tax	$192,009	$10/capita	$10/resident	Present rate--new employees expected to have similar disposable income
Cigarette and Gasoline Tax	NA	NA	NA	NA
Road Funds	$166,851	$9/capita	$9/capita	Present rate
State and Local Transfers	$ 56,434	$3/capita	$3/capita	Present rate
Federal Transfers	$180,858	$9/capita	$9/resident	Present rate
Grants	$ 55,848	$3/capita	$55,848	Present rate

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[a] Revenues are based on the 1976 Audit Report submitted to the Utah Office of the State Auditor.

EXHIBIT F-1. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

County of Carbon	Calendar Year 1976 Total Revenue[a]	Calendar Year 1976 Rate Basis	Future Rate Basis	Comments/Explanations
Fees & Service Charges	$136,835	$7/capita	$7/capita	Present rate
Royalties	NA	NA	NA	NA
Miscellaneous	$271,045	$14/capita	$14/capita	Present rate

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[a] Revenues are based on the 1976 Audit Report submitted to the Utah Office of the State Auditor.

Population = 7,800 (1977)
1976-77 Budget

EXHIBIT F-2. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES

City of Price	Fiscal Year 1977 Total Revenue[a]	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations
Ad Valorem Tax	$108,680	NA	New residential assessed valuation at: $7,000 per single family unit $3,600 per multi-family unit $2,600 per mobile home and "other" unit	
Sales Tax	$468,113	$60/capita	$60/capita	New employees expected to have similar disposable incomes
Cigarette and Gasoline Tax	NA	NA	NA	NA
Road Funds	$55,396	$7/capita	$7/capita	Present rate
Utilities Service Charges	$1,621,926	$207/capita	$207/capita	Present rate

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[a] Revenues are based on the 1976-77 Audit Report submitted to the Utah Office of the State Auditor.

EXHIBIT F-2. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

City of Price	Fiscal Year 1977 Total Revenue[a]	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations
Utilities Tap Fees	$72,616	$9/capita	Residential: $250/new sewer tap $200/new water tap Commercial: Same	The rate of $250 for sewer tap fees is known--to get the water tap fee $250 was divided into $39,500 (total amount collected for sewer tap fees) to find the total taps (158). 158 was then divided into $33,116 to get approximate amount charged for water taps.
Other User Charges	$92,681	$12/capita	$12/capita	Present rate
Other Fund Transfers	$82,023	$11/capita	$82,023	Present rate
State Transfers	$88,464	$11/capita	$88,464	Present rate
Federal Transfers	$208,375	$27/capita	$208,375	Present rate
Grants	$149,440	$19/capita	$149,440	Present rate
Fees and Licenses	$190,561	$24/capita	$24/capita	Present rate
Mineral Royalties	NA	NA	NA	NA
Miscellaneous	$325,795	$42/capita	$42/capita	Present rate

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[a] Revenues are based on the 1976-77 Audit Report submitted to the Utah Office of the State Auditor.

Student Enrollment = 4,341 (1977)
1976-77 Budget

EXHIBIT F-3. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES

School District	Fiscal Year 1977 Total Revenue[a]	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations
Ad Valorem Taxes	$984,513	NA	New residential assessed valuation at: $7,000 per single family unit $3,600 per multi-family unit $2,600 per mobile home and "other" unit	
Minimum School Program + Voted Leeway Program	$3,745,968	$863/student	Local share = (31.410 mills ÷ 52.330 mills) (Ad valorem receipts) State share = ($863 x enrollment)- (Local share) The remainder of the local taxes goes into the Ad Valorem fund.	Simplified: ($863 x enrollment) - (.6 x local ad valorem revenues)
Other State Transfer Funds	$984,200	$227/student	$227/student	Present rate
Grants	$290,910	$67/student	$290,910	Present rate
P.L. 81-874	$167,882	$39/student	$39/student	Present rate

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[a] Revenues are based on the information found in the Utah School System Annual Report 1976-77 Fiscal Year.

EXHIBIT F-3. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

School District	Fiscal Year 1977 Total Revenue[a]	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations
Other Federal Funds	$136,622	$31/student	$136,622	Present rate
Miscellaneous[b]	$472,781	$109/student	$109/student	Present rate

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[a] Revenues are based on the information found in the Utah School System Annual Report 1976-77 Fiscal Year.

[b] Includes other local revenues, tuition fees, local transportation fees, lunch sales, sale of equipment, net insurance recovery.

was 9.42 percent of the value.[16] However, it was learned from an interview at the Property Tax Division of the Utah Tax Commission that all property in the state was to be reassessed at 20 percent of the value.[17] The computer program is not designed so that assessed valuations can be changed in Year 2. Therefore, only the 20 percent rate was used to derive the following valuation per new unit:

$7,000 per single family unit
$3,600 per multi-family unit
$2,600 per mobile home
$2,600 per "other" unit (e.g., worker barracks)

New residential tax receipts were estimated on the number of new units of each housing type demanded in each jurisdiction. Commercial and industrial valuation was determined on a per capita basis. The base year commercial and industrial valuation was divided by base year population to obtain an average per capita rate.

Interviews were held at the state level to determine valuation techniques and factors currently being applied to coal mines.* The assessed value was determined to be $2.92 per ton of coal produced.[18] No other types of energy facilities were assumed to take place in Carbon County in this case study (see Section A: Description of Energy Development).

The Utah Minimum School Program guarantees each district a set amount per weighted pupil average each year. A simplified formula was derived to calculate this total amount within the computer model. The formula worked on a per pupil basis and included the state and local contributions to the Minimum School Program and the district's Voted Leeway Program.*

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*In the secondary case study, ad valorem taxation was not estimated separately for capital investment and for the value of production.

Grants and transfers from other governmental entities were estimated to continue at the same amount as recorded in the audit statement or annual report. All other revenues were estimated as a function of the population (total receipts divided by population). Each revenue source was projected to continue at the calculated per capita rate.** Exhibits F-1, F-2 and F-3 summarize the revenue inputs for each jurisdiction.

Operating expenditures projections. Based on the budgets, expenditures were divided into appropriate categories of manageable size. These categories were estimated on per capita rates of expenditures (see Exhibits F-4, F-5 and F-6). With two exceptions, these were projected to continue at their present rate. At present, the city has a volunteer fire department and, it was expected that when the population reached approximately 10,000, they would need to move to a full-time operation.[19] However, the computer program is not capable of changing expenditure rates on an annual basis. Therefore, it was decided that the increased rate would become effective immediately. The expenditure rate for streets and drainage was also raised because the city could be expected to have to spend more money on drainage as the population increases.[20]

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*The formula was based on conversations with Dr. Bishop at the Utah State Board of Education.

**Per capita rates for sales tax revenues for the city and county were not projected to increase because the coal mining industry was already a large portion of the economy.

Population = 19,300
1976 Budget

EXHIBIT F-4. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

County of Carbon	Calendar Year 1976 Total Expenditure[a]	Calendar Year 1976 Rate Basis	Future Rate Basis	Comments/Explanations
General Administration	$536,406	$28/capita	$28/capita	Present rate
Sheriff	$140,622	$7/capita	$7/capita	Present rate
Fire	$15,945	$.83/capita	$.83/capita	Present rate
Health, Welfare and Hospitals	$126,277	$7/capita	$7/capita	Present rate
Roads and Bridges	$517,437	$27/capita	$27/capita	Present rate
Library and Recreation	$ 4,978	$.26/capita	$.26/capita	Present rate
Transfer to other Governmental Entities	$ 5,745	$.30/capita	$.30/capita	Present rate
Miscellaneous	$ 92,447	$5/capita	$5/capita	Present rate

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[a] Expenditures are based on the 1976 Audit Report submitted to the Utah Office of the State Auditor.

Population 7,800 (1977)
1976-77 Budget

EXHIBIT F-5. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

City of Price	Fiscal Year 1977 Total Expenditure[a]	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations
General Administration	$387,524	$50/capita	$50/capita	Present rate
Police	$192,406	$25/capita	$25/capita	Present rate
Fire	$32,989	$4/capita	$14/capita	Increase due to need to move from volunteer to full-time fire department--4 officers @ $25,000 each including salary, equipment and administrative expenses
Streets (and Drainage)	$136,266	$17/capita	$24/capita	Increased costs due to more money to be spent on drainage as city grows
Health, Welfare and Recreation	$193,891	$25/capita ($7 for Health & Welfare; $18 for Recreation)	$25/capita	Present rate
Utilities	$1,199,138	$154/capita	$154/capita	Present rate
Miscellaneous	$141,218	$18/capita	$18/capita	Present rate

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[a] Expenditures are based on the 1976-77 Audit Report submitted to the Utah Office of the State Auditor.

Student enrollment = 4,341 (1977)
1976-77 Budget

EXHIBIT F-6. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

School District	Fiscal Year 1977 Total Expenditure[a]	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations
Instruction	$3,033,452	$699/enrollee	$699/enrollee	Present rate
Transportation	$199,662	$46/enrollee	$46/enrollee	Present rate
Administration and Miscellaneous	$2,326,252	$536/enrollee	$536/enrollee	Present rate

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[a] Expenditures are based on the information found in the Utah School System Annual Report 1976-77 Fiscal Year.

Capital expenditures projections. A population-serving threshold approach was used (i.e., population capacities were determined for an existing facility and a new or expanded facility is projected once the population exceeds the capacity). Due to the nature of the Utah secondary case study, all facilities were designated at capacity. Secondary sources were used to derive the facility standards and construction costs. Each entity had miscellaneous capital expenditures which could only be forecast on a per capita basis. For purposes of the computer model, these were included with operating expenditure inputs because capital expenditures could only be calculated with a threshold approach. Exhibits F-7, F-8 and F-9 give the capital budgetary inputs for each of the three jurisdictions.

Results--secondary case study. The computer output includes projected revenues, operating expenditures and capital expenditures for 13 years for each jurisdiction. Operating and capital expenditures are combined and then compared with revenues to show either a surplus or deficit. Exhibits F-10, F-11 and F-12 compare the results of Scenario I and II for each entity.

As might be expected, all three are in much better financial shape in Scenario I with its lower level of development. The city and school district continue to have surpluses; however, the county's financial condition gradually worsens until in Year 13, they have a deficit of about -$160,000.

The increased level of energy development in Scenario II causes financial problems in all three jurisdictions. In Price and Carbon Counties

Population = 19,300
1976 Budget

EXHIBIT F-7. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES

County of Carbon	Thresholds	Capital Outlays[a]	Comments/Explanations	Source
Administration ($6,197)[b]	Increments beyond present population	$22,128	585 sq. ft. of building per 1,000 population @ $37.33 per sq. ft. + $290 (land cost)	Secondary source[23]
Sheriff ($20,270)	Increments beyond present population	$6,644	150 additional sq. ft. per 6,000 population @ $43.80 per sq. ft. + $74 (land cost)	Secondary source[24]
	Increments beyond present population	$6,000	1 vehicle per 4,000 population @ $6,000 per vehicle	Secondary source[25]
Fire (0)	30,000 population & every 10,000 thereafter	$109,245	1 new station per 10,000 population @ 3,000 sq. ft. @ $35.92/sq. ft. + $1,485 (land cost)	Secondary source[26]
	Increment beyond present population	$146,000	2 pumpers per 10,000 population @ $50,000 each 1 staff car per 10,000 population @ $6,000 each 1 ambulance per 10,000 population @ $40,000 each	Secondary source[27]
Health, Welfare and Hospital ($11,883)	Increments beyond present population for hospital	$161,122; $155,468 after 25,000 population	4 beds per 1,000 population @ 720 sq. ft. per bed in 100 bed hospital until 25,000 population in county, then 690 sq. ft. per bed @ $55.45 per sq. ft. + $1,426 (land cost)	Secondary source[28]

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[a] Capital outlays are based on the 1976 Audit Report submitted to the Utah Office of the State Auditor.

[b] The dollar amounts in parenthesis under each category are the capital expenditures in the 1976 budget.

EXHIBIT F-7. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

County of Carbon	Thresholds	Capital Outlays[a]	Comments/Explanations	Source
Roads and Bridges ($53,214)[b]	Increments beyond present population	$625,000	5 miles of secondary roads per 1,000 population @ $125,000/mile	
Recreation (0)	Increments beyond present population:			
	District park	$30,728	2 acres per 1,000 population @ $13,764 per acre + $3,200 (land cost)	Secondary sources[29]
	Swimming pool	$152,635	1 42'x82' pool per 25,000 population; 2 acre site per pool @ $43.39/sq. ft. = $149,435 + $3,200 (land cost)	Secondary sources[30]
	Ice Skating Rink	$21,224	1 indoor rink per 25,000 population; 1 600 sq. ft. building, 0.5 acres @ $34.04 per sq. ft. + $800 (land cost)	Secondary source[31]
	Community Building	$160,706	1 building per 30,000 population; 5,000 sq. ft. building @ $32.02 per sq. ft. + $606 (land cost)	Secondary source[32]
Miscellaneous ($5,687)	Yearly	$.29/capita	Present capital costs per resident	

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[a] Capital outlays are based on the 1976 Audit Report submitted to the Utah Office of the State Auditor.

[b] The dollar amounts in parenthesis under each category are the capital expenditures in the 1976 budget.

Population = 7,800 (1977)
1976-77 Budget

EXHIBIT F-8. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES

City of Price	Thresholds	Capital Outlays[a]	Comments/Explanations	Source
Administration ($29,341)[b]	Increments beyond present population	$11,348	300 sq. ft. per 1,000 population @ $37.33 per sq. ft. + $149 (land cost)	Secondary source[33]
Police ($924)	Increments beyond present population	$90,362	2,040 sq. ft. per 6,000 population @ $43.80 per sq. ft. + $1,010 (land cost)	Secondary source[34]
		$6,000/vehicle	1 vehicle per 3,300 population	Secondary source[35]
Fire ($125)	Present & every increment of 10,000 population thereafter	$109,245	1 station per 10,000 population @ 3,000 sq. ft. @ $35.92/sq. ft. + $1,485 (land cost)	Secondary source[36]
	Increment beyond present population	$146,000	2 pumpers per 10,000 population @ $50,000 each 1 staff car per 10,000 population @ $6,000 each 1 ambulance per 10,000 population @ $40,000 each	Secondary source[37]
Streets (and Drainage) ($334,309)	Increments beyond present population up to & including 9,000	$787,500	6.3 miles of secondary roads per 1,000 population @ $125,000 per mile	Allen Vorhees & Associates
Streets	Increments beyond 10,000	$625,000	5 miles of secondary roads per 1,000 population @ $125,000 per mile	Allen Vorhees & Associates
Drainage	Increments beyond present population	$3,472,647	Addition to system every 10,000 population	Secondary source[38]

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[a] Capital outlays are based on the 1976-77 Audit Report submitted to the Utah Office of the State Auditor.

[b] The dollar amounts in parenthesis under each category are the capital expenditures in the 1976-77 budget year.

EXHIBIT F-8. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

City of Price	Thresholds	Capital Outlays[a]	Comments/Explanations	Source
Health, Welfare and Recreation ($55,466)[b]	Increments beyond present population:			
	Community park	$40,982	3.6 acres per 1,000 population @ $9,784 per acre + $5,760 (land cost)	Secondary sources[39]
	Neighborhood park	$19,556	2 acres per 1,000 population @ $8,178 per acre + $3,200 (land cost)	Secondary sources[40]
	Playfield	$9,825	1.5 acre per 1,000 population @ $4,950 per acre + $2,400 (land cost)	Secondary sources[41]
	Playground	$37,101	1.5 acres per 1,000 population @ $23,134 per acre + $2,400 (land cost)	Secondary sources[42]
	Baseball field	$55,000	1 field per 3,000 population @ $55,000 per field	DRI
	Softball field	$28,675	1 field per 3,000 population @ $28,675 per field	Secondary source[43]
	Tennis Court	$13,368	1 court per 2,000 population; 0.23 site per court @ $13,000 per court + $368 (land cost)	Secondary sources[44]
Utilities ($1,046,779) Water	28,740 + every increment of 10,000 population thereafter	$5,851,470	To increase entire water supply system to an additional 10,000 capacity	Secondary source[45]

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[a] Capital outlays are based on the 1976-77 Audit Report submitted to the Utah Office of the State Auditor.

[b] The dollar amounts in parenthesis under each category are the capital expenditures in the 1976-77 budget year.

EXHIBIT F-8. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

City of Price	Thresholds	Capital Outlays[a]	Comments/Explanations	Source
Utilities (cont.) Sewer	24,100 and every increment of 10,000 population thereafter	$2,702,669	To increase entire sanitary sewerage system to an additional 10,000 capacity	Secondary source[46]
Miscellaneous ($19,171) b	Increments beyond present population for library	$97,145	1,000 sq. ft. of building per 1,000 population @ $48.74/sq. ft. and 3,000 books per 1,000 population @ $16 per volume + $405 (land cost)	Secondary sources[47]

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[a] Capital outlays are based on the 1976-77 Audit Report submitted to the Utah Office of the State Auditor.

[b] The dollar amounts in parenthesis under each category are the capital expenditures in the 1976-77 budget year.

Student Enrollment - 4,341 1977
1976-77 Budget

EXHIBIT F-9. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES

School District	Thresholds	Capital Outlays[a]	Comments/Explanations	Source
Schools ($738,110)[b]	Increments beyond present population	$1,316,200	Expansion of school facilities for each 400 new enrollees based on 100 sq. ft. per new student @ $32.41/sq. ft. + $19,800 (land cost)	DRI, based on secondary source[48]
Administration ($2,939)	Increments beyond present population	$56,992	6 administrative personnel per 1,000 students with 150 sq. ft. per employee = 1,650 sq. ft. per 1,000 students @ $34.27/sq. ft. + $446 (land cost)	DRI, based on secondary sources[49]
Miscellaneous ($132,279)	Yearly	$30/enrollee	Present capital costs per enrollee	

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[a] Capital outlays are based on the information found in the Utah School System Annual Report 1976-77 Fiscal Year.

[b] The dollar amounts in parenthesis under each category are the capital expenditures in the 1976-77 budget year.

EXHIBIT F-10. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, CARBON COUNTY

The Results of Scenarios I and II, Secondary Case Study

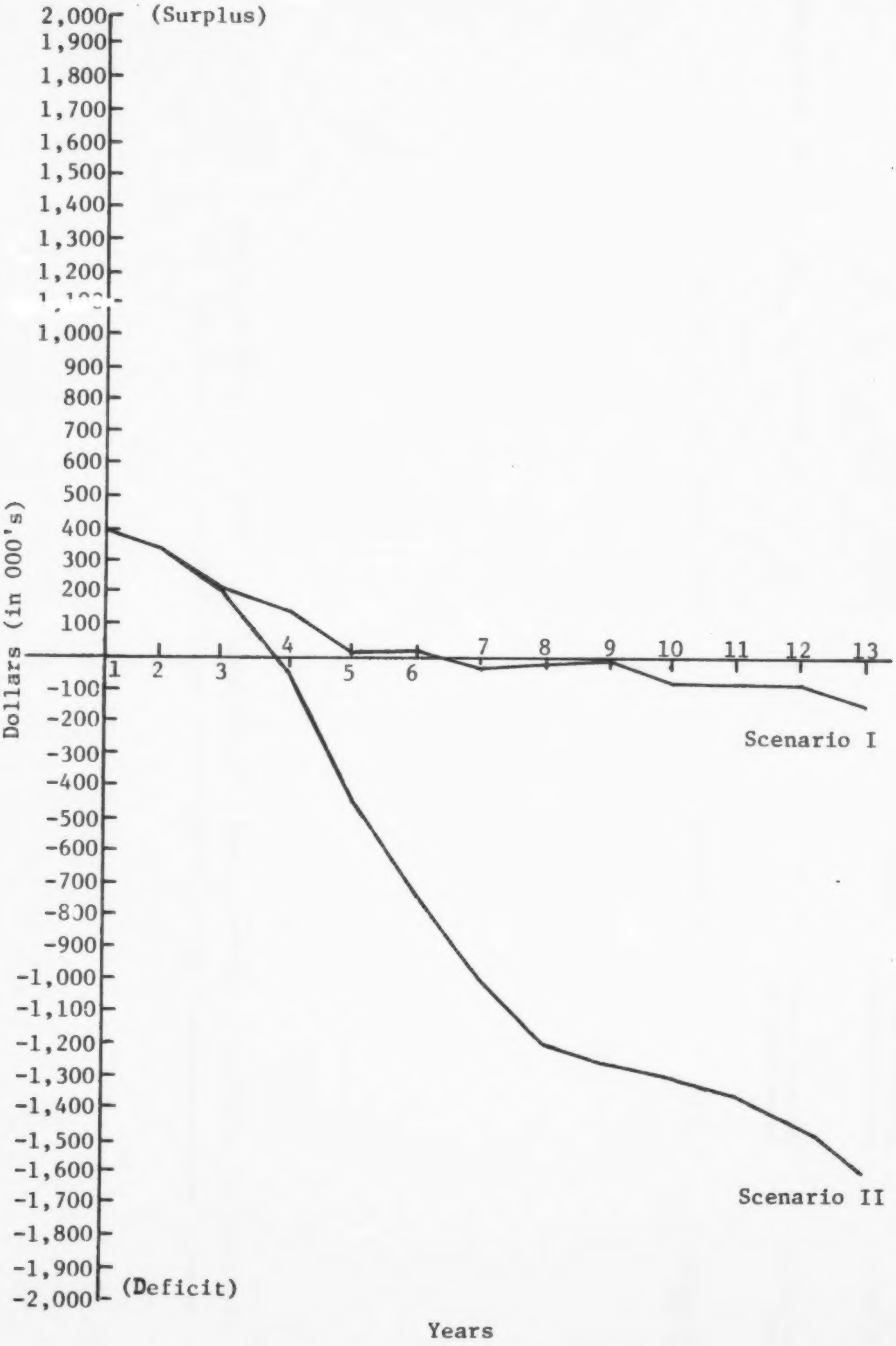


EXHIBIT F-11. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, PRICE

The Results of Scenarios I and II, Secondary Case Study

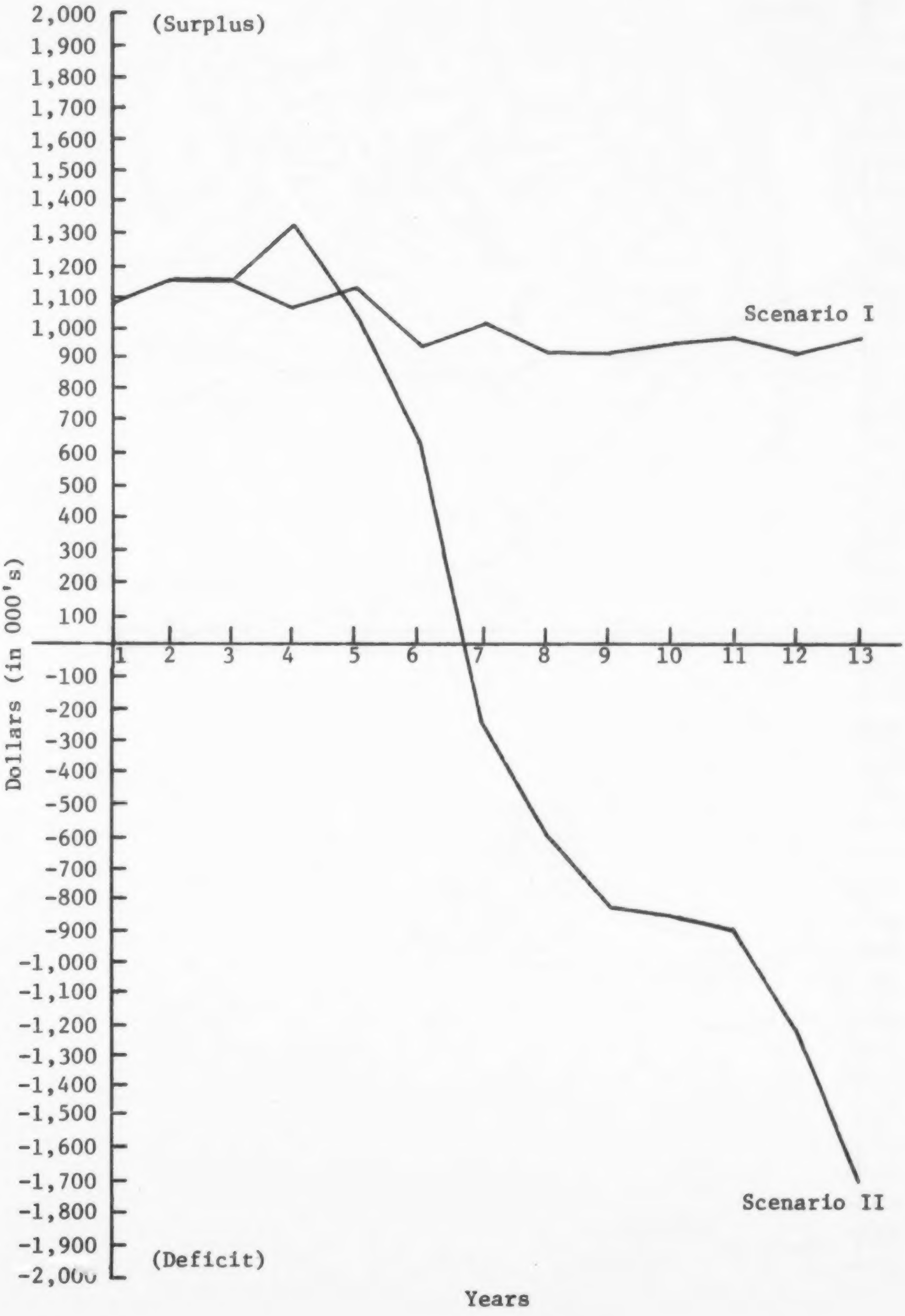
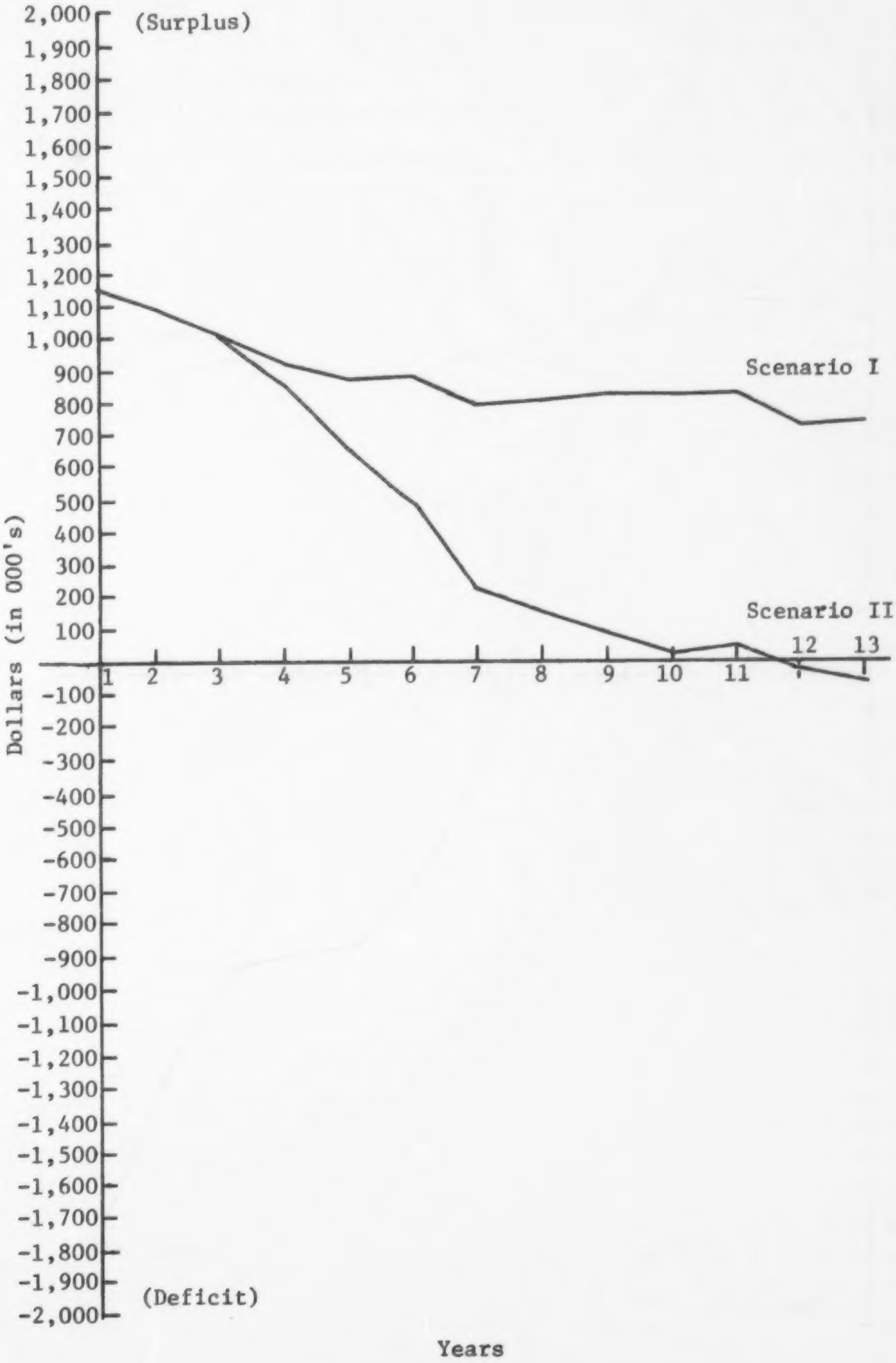


EXHIBIT F-12. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, CARBON SCHOOL DISTRICT

The Results of Scenarios I and II, Secondary Case Study



the problems are severe. By Year 13 the governments have deficits of approximately -$1,700,000 and -$1,600,000 respectively. The school district is able to maintain surpluses until the last two years when it shows a deficit of -$20,000 and then -$76,700.

Procedure--primary case study. This section presents the steps taken to implement the fiscal assessment process using primary data for Carbon County, Price and the Carbon County School District. Where appropriate, comparisons are made between this approach and the one utilizing secondary data described earlier.

Revenue projections. The most recent actual budgets* were examined for this case study. The revenue categories remained the same as those used previously. Again, the residential assessed valuation was calculated using average housing prices derived from local interviews (see Section G: Housing). The assessment rate was 20 percent of the market value of the house or apartment. The assessed valuation for a mobile home was determined based on an interview with the county assessor. The following valuations per new unit were derived:

$10,000	per single family unit
$5,000	per mobile home unit
$1,840	per mobile home
$1,840	per "other" unit (e.g., worker barracks).

As discussed earlier, new residential receipts were estimated on the number of new units of each housing type needed in each jurisdiction. Commercial and industrial valuation was calculated on a per capita basis.*

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*The Carbon County budget was for calendar year 1977 and the City of Price and School District budgets were for fiscal year 1977-78. The population estimates were the official ones being used by the Southeastern Utah Association of Governments that corresponded to the budget year.

In the primary case study ad valorem taxation on coal mines was estimated separately for capital investment and for the value of production. The total assessed value was still estimated to be $2.92, of which $2.34 applied to capital investment and $.58 to production.[21] The assessed valuation for the power plant units was based on that of Huntington Units 1 and 2.[22]

Many of the assumptions used to determine future rate bases remained the same. The formula derived for the Minimum School Program in the Secondary case study was used, however, the per pupil rate increased.** Except in the case of the school district, grants and transfer payments from the federal or state governments were estimated on a lump sum basis. The future amounts were determined during interviews with local officials.

The rest of the revenues were estimated on a per capita basis (i.e., total receipts divided by population). Future per capita rates were derived by discussing present rates on a line-item by line-item basis with local officials to determine if the amount could be expected to increase, stay at the present rate or be discontinued.

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*The per capita rate was determined by dividing the 1977 commercial and industrial assessed valuation by the 1977 population.

**This was a simplified calculation which could be done within the computer model. It included the state and local contributions to the Minimum School Program and Utah Leeway Program.

1977 Budget
Population (1977 est.) = 20,500

EXHIBIT F-13. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES

County of Carbon	Calendar Year 1977 Total Revenue[a]	Calendar Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Operating Revenues: Ad Valorem Taxes	$970,670	NA	New residential assessed valuation at: $10,000 per single family unit $5,200 per multi-family unit $1,840 per mobile home and "other" unit		DRI, based on interviews with Tomsic and Downard
General Sales and Use Tax	$135,350	$7/capita	$10/capita	Already seeing increase, new employees expected to have higher disposable incomes, also as mines expand more machinery will be sold	DRI, based on interview with Pritchard
Cigarette and Gasoline Tax	NA	NA	NA	NA	NA
Road Funds	$172,180	$8/capita	$9/capita	Formula based on land area, miles of road and population last census. Two of the three factors are expected to increase in the future.	DRI, based on interview with Pritchard

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

EXHIBIT F-13. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

County of Carbon	Calendar Year 1977 Total Revenue[a]	Calendar Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
State and Local Transfers	$63,440	$3/capita	$3/capita	Present rate	DRI
Federal Transfers	$198,030	$10/capita	$198,030	Present rate	DRI
Grants	$234,030	$11/capita	$73,000	CETA Grant ($59,321)--and anti-recession funds only ones expected to continue	DRI, based on interview with Pritchard
Fees and Service Charges	$186,000	$9/capita	$9/capita	Present rate	DRI
Royalties	NA	NA	NA	NA	NA
Miscellaneous	$542,690	$26/capita	$26/capita	Present rate	DRI
	In 1979		$400,000	Hospital Assets will be sold to the Hospital Corporation of America and the amount will be split equally between the city and county ($700,000-$1,000,000)	DRI, based on interview with Senken

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

EXHIBIT F-13. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

County of Carbon	Calendar Year 1977 Total Revenue[a]	Calendar Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Miscellaneous (cont.)	In 1979 and 1980		$75,000 each year	From Hospital Corporation of America for lease of present building ($150,000 split between city and county)	DRI, based on interview with Semken

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

1977-78 Budget
Population = 8,500

EXHIBIT F-14. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES

City of Price	Fiscal Year 1978 Total Revenue[a]	Fiscal Year 1978 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Ad Valorem Tax	$128,260	NA	New residential assessed valuation at: $10,000 per single family unit $5,200 per multi-family unit $1,840 per mobile home and "other" unit		DRI, based on interviews with Tomsic and Downard
Sales Tax	$439,160	$52/capita	$52/capita	Present rate	DRI, based on interview with Tomsic
Cigarette and Gasoline Tax	NA	NA	NA	NA	NA
Road Funds	$39,080	$5/capita	$5/capita	Present rate	DRI, based on interview with Tomsic
Utilities Service Charges	$1,924,820	$226/capita	$226/capita	Present rate	DRI

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

EXHIBIT F-14. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

City of Price	Fiscal Year 1978 Total Revenue[a]	Fiscal Year 1978 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Utilities Tap Fees	$65,090	$8/capita	Residential-- single family: $350 for water $400 for sewer multi-family: $550 for water $400 for first unit + $100 for each additional unit for sewer commercial: $900 for water $400 for sewer	Simplified for computer program purposes to $250 per new resident	DRI, based on interview with McArthur
Other User Charges	$36,600	$4/capita	$4/capita	Present rate	DRI
County Transfers	$4,950	$.60/capita	$.60/capita	To pay Price for fire calls made in county	DRI, based on interviews with McArthur and Pritchard
State Transfers	$57,110	$7/capita	$17,800	$39,300 was from Utah DOT for water line relocation--not expected to continue	DRI, based on interview with McArthur

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

EXHIBIT F-14. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

City of Price	Fiscal Year 1977 Total Revenue[a]	Fiscal Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Federal Transfers	$100,250	$12/capita	$115,000	$115,000 is the projected amount Price is to receive in FY 78-79 and is a better estimate of the Revenue Sharing amount due Price	DRI, based on interview with McArthur
Grants	$66,200	$8/capita	$33,257	Only CETA and Anti-recession Allotment expected to continue with any regularity	DRI, based on interview with McArthur
Fees and License	$165,060	$19/capita	$19/capita	Present rate	DRI, based on interview with Tomsic
Mineral Royalties	NA	NA	NA	NA	NA
Miscellaneous	$191,150	$22/capita	$22/capita	Present rate	
	In 1979		$400,000	Hospital Assets will be sold to the Hospital Corporation of America and the amount will be split equally between the city and county ($700,000-$1,000,000)	DRI, based on interview with Semken

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

EXHIBIT F-14. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

City of Price	Fiscal Year 1978 Total Revenue[a]	Fiscal Year 1978 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Miscellaneous (cont.)	In 1979 and 1980		$75,000 each year	From Hospital Corporation of America for lease of present building ($150,000 split between city and county)	DRI, based on interview with Semken

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

1977-78 Budget
Student enrollment (4th week of October 1977) = 4,341

EXHIBIT F-15. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES

School District	Fiscal Year 1978 Total Revenue[a]	Fiscal Year 1978 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Ad Valorem Taxes	$1,212,940	NA	New residential assessed valuation at: $10,000 per single family unit $5,200 per multi-family unit $1,840 per mobile home and "other" unit		DRI, based on interviews with Tomsic and Downard
Minimum School Program + Voted Leeway Program	$4,067,300	$937/student	Local share = (31.410 mills ÷ 52.330 mills) (Ad valorem receipts) State share = ($937 x enrollment) - (Local share) The remainder of the local taxes goes into the Ad Valorem fund	Simplified: ($937 x enrollment) - (.6 x local ad valorem revenues)	DRI, based on interview with Bishop
Other State Transfer Funds	$1,185,230	$273/student	$273/student	Present rate	DRI
Grants	$296,840	$68/student	$68/student	Present rate	DRI
P.L. 81-874	$222,440	$51/student	$51/student	Present rate	DRI

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

EXHIBIT F-15. ASSUMPTIONS USED IN ESTIMATING PUBLIC REVENUES (Cont.)

School District	Fiscal Year 1978 Total Revenue[a]	Fiscal Year 1978 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Other Federal Funds	$183,290	$42/student	$42/student	Present rate	DRI
Miscellaneous	$498,760	$115/student	$115/student	Present rate	DRI

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[a] Revenues are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

During the interview phase of this case study, the city and county were negotiating to sell their hospital to the Hospital Corporation of America.* In September, local officials were projecting that both entities would receive about $400,000 in 1979 and $75,000 (for lease of the present building) in 1979 and 1980. Because the computer model has no provisions for inputting amounts for only two years, these revenues were not considered in the total revenue picture for Years 3 and 4. Exhibits F-13, F-14 and F-15 summarize revenue inputs for each jurisdiction.

Operating expenditure projections. The same categories were used to determine present per capita rates of expenditures. Local officials were interviewed in order to determine the most accurate rates for the future.** Wherever possible, local officials were asked if they thought the present expenditure rate would remain the same or increase. If an increase was projected, an attempt was made to determine a specific amount.

As in the secondary case study, the city's expenditures for the fire department increased substantially because of the need to go to a full-time department. Even though the optimum size for this is a community of 10,000, it occurred immediately because of the way the computer model was designed. Inputs for operating expenditures are summarized in Exhibits F-16, F-17 and F-18.

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*A contract was finalized in October 1978.

**For example, Carbon County's health, welfare and recreation expenditures were decreased from $7/capita to $6/capita because of the sale of the hospital.

1977 Budget
Population (1977 est.) = 20,500

EXHIBIT F-16. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

County of Carbon	Calendar Year 1977 Total Expenditure[a]	Calendar Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
General Administration	$600,700	$29/capita	$29/capita	Present rate	DRI
Sheriff	$180,300	$9/capita	$9/capita	Present rate	DRI
Fire	$54,340	$3/capita	$3/capita	Present rate--for services rendered by Price (and other communities) Fire Departments--county has no fire department of their own	DRI, based on interview with Pritchard
Health, Welfare and Hospitals	$142,020	$7/capita	$6/capita	Of total--$14,074 was spent for County Hospital--hospital being sold to Hospital Corporation of America	DRI, based on interviews with Pritchard and Semken
Roads and Bridges	$378,120	$18/capita	$20/capita	Increased mining production and population means more road work, therefore more employees	DRI

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[a] Expenditures are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

EXHIBIT F-16. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES (Cont.)

County of Carbon	Calendar Year 1977 Total Expenditure[a]	Calendar Year 1977 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Recreation	$8,670	$.42/capita	$.42/capita	Present rate	DRI
Contributions to Other Governmental Entities	$30,250	$1/capita	$1/capita	Present rate	DRI
Miscellaneous	$94,190	$5/capita	$5/capita	Present rate	DRI

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[a] Expenditures are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

1977-78 Budget
Population = 8,500

EXHIBIT 17. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

City of Price	Fiscal Year 1978 Total Expenditure[a]	Fiscal Year 1978 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
General Administration	$334,950	$39/capita	$39/capita	Present rate	DRI, based on interview with Tomsic
Police	$207,470	$24/capita	$24/capita	Present rate	DRI, based on interview with Tomsic
Fire	$29,890	$4/capita	$14/capita	Increase due to need to move from volunteer to full-time fire department--4 officers @ $25,000 each including salary, equipment and administrative expenses	DRI
Streets (and Drainage)	$266,760	$31/capita	$31/capita	Present rate	DRI
Health, Welfare and Recreation	$217,610	$26/capita ($8 for Health & Welfare; $18 for Recreation)	$26/capita	Present rate	DRI, based on interview with Tomsic

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[a] Expenditures are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

EXHIBIT F-17. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES (Cont.)

City of Price	Fiscal Year 1978 Total Expenditure[a]	Fiscal Year 1978 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Utilities	$1,393,130	$164/capita	$226	Increase due to rising costs	DRI, based on interview with Tomsic
Miscellaneous	$177,940	$21/capita	$21/capita	Present rate	DRI, based on interview with Tomsic
Intergovernmental Contribution	$5,000	.60/capita	.60/capita	Present rate	DRI, based on interview with Tomsic

---

[a] Expenditures are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

1977-78 Budget
Student enrollment (4th week of
October 1977) = 4,341

EXHIBIT F-18. ASSUMPTIONS USED IN ESTIMATING PUBLIC OPERATING EXPENDITURES

School District	Fiscal Year 1978 Total Expenditure[a]	Fiscal Year 1978 Rate Basis	Future Rate Basis	Comments/Explanations	Source[b]
Instruction	$3,415,420	$787/student	$787/student	Present rate	DRI, based on interview with Nelson
Transportation	$230,320	$53/student	$53/student	Present rate	DRI, based on interview with Nelson
Administration and Miscellaneous	$2,658,780	$612/student	$612/student	Present rate	DRI, based on interview with Nelson

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[a] Expenditures are based on the budgets for each governmental entity and on information provided by interviews with local officials. Figures are rounded to nearest $10.

[b] A detailed list of names and positions is given at the end of Section F.

Capital expenditures projections. The basic means of projecting capital expenditures was a population serving threshold approach. In interviews with local officials, attempts were made to determine population capacities of existing facilities. However, in most cases, they were more accustomed to thinking in terms of years when facilities are needed. In some cases, a population estimate was determined based on the Southeastern Utah Association of Government's yearly projections. In others, it was more appropriate to talk in terms of a year threshold. Because the computer model cannot handle year thresholds, part of it had to be run once to determine the population projections. From the output, these year thresholds were transformed into population thresholds and the entire model was run again.

Exhibits F-19, F-20 and F-21 show the capital expenditure inputs used for each of the three jurisdictions. In some instances, the generalized facility standards were completely replaced by data received from the local officials. For example, the size and the construction cost per square foot of the new Criminal Justice Center were based entirely on local information. In other instances, officials could not improve on the standards.

As in the secondary case study, each jurisdiction had miscellaneous capital expenditures that were forecast on a per capita basis. These were moved to the operating expenditures for model input purposes because capital expenditures are only calculated using a threshold approach.

Results--primary case study. The computer model includes a comparison of revenues and expenditures and the output provides a yearly report of either surpluses or deficits for each jurisdiction. Exhibits F-22, F-23 and F-24 compare the results of Scenarios I and II for each

1977 Budget
Population (1977 est.) = 20,500

EXHIBIT F-19. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPTIAL EXPENDITURES

County of Carbon	Thresholds	Capital Outlays[a]	Comments/Explanations	Source[b]
Administration ($131,890)[c]	--	--	After new Criminal Justice Center built, the lawyers, law library, etc., will be moved into that building, thus providing more office space. Also, other non-county functions could be moved out of the courthouse, therefore space is adequate.	DRI, based on interview with Semken
Sheriff ($11,890)	1980	$600,000	Criminal Justice Center to house County Sheriff and City Police Departments @ 7,500 sq.ft. @ $80 per sq. ft.	DRI, based on interview with Semken
	Increments beyond present population	$5,900	1 vehicle per 4,000 population @ $5,900	Secondary source,[50] and interview with Semken
Fire (0)	--	--	City fire departments serve county	DRI, based on interview with Pritchard
	1978	$22,000	1 rescue unit @ $22,000	DRI, based on interview with Pritchard
	30,000 population and increments thereafter	$40,000	1 ambulance per 10,000 population @ $40,000	Secondary source[51]
Health, Welfare and Hospital ($13,030)	--	--	Hospital soon to be run by Hospital Corporation of America, presently working on agreement to sell assets	--

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[a] All capital outlays have been rounded to the nearest $10.

[b] A complete list of reference sources is given at the end of Section F.

[c] The dollar amounts in parentheses under each category are the capital expenditures in the 1978 budget year.

EXHIBIT F-19. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

County of Carbon	Thresholds	Capital Outlays[a]	Comments/Explanations	Source[b]
Roads and Bridges ($18,390)[c]	1979	$160,000	Replace 4 bridges @ an average of $40,000 each	DRI, based on interview with Johnsto
	1980	$160,000	Replace 4 bridges @ an average of $40,000 each	DRI, based on interview with Johnsto
	1981	$160,000	Replace 4 bridges @ an average of $40,000 each	DRI, based on interview with Johnsto
	Increments beyond present population	$625,000	5 miles of secondary roads per 1,000 population @ $125,000 per mile	Allen Vorhees & Associates
Recreation (0)	Ice skating rink in 1980 and increments thereafter	$20,420	1 indoor rink per 25,000 population; 1 600 sq.ft. building @ $34.04 per sq.ft. at fairgrounds	DRI, based on interviews with Semken, Marx and Simone
	Baseball field 1979 and increments thereafter	$55,000	1 field per 3,000 population @ $55,000 for field at fairgrounds	DRI, based on interviews with Semken, Marx and Simone
	Golf course 1979	$866,000	To purchase private course (full price is $1,732,000--county asking for BOR Grant for 50% of cost)	DRI, based on interviews with Semken, Marx and Simone
	Drag strip 1979	$200,000	To build drag strip at fairgrounds	DRI, based on interviews with Semken, Marx and Simone
	Swimming pool at 25,000 population and increments thereafter	$149,440	1 42'x82' pool per 25,000 population at $43.39 per sq.ft. at fairgrounds	DRI, based on interviews with Semken, Marx and Simone

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[a] All capital outlays have been rounded to the nearest $10.

[b] A complete list of reference sources is given at the end of Section F.

[c] The dollar amounts in parentheses under each category are the capital expenditures in the 1978 budget year.

EXHIBIT F-19. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

County of Carbon	Thresholds	Capital Outlays[a]	Comments/Explanations	Source[b]
Recreation (cont.) (0)[c]	Community building at 30,000 population and increments thereafter	$160,100	1 building per 30,000 population; 5,000 sq.ft. building @ $32.02 per sq.ft. at fairgrounds	DRI, based on interviews with Semken, Marx and Simone
Miscellaneous ($153,050)	Yearly	$7/capita	Present capital costs per resident	DRI
	Sewers 24,100 and increments thereafter	$2,702,670	To increase entire sanitary sewerage system to an additional 10,000 capacity	Secondary source,[52] and interview with Tomsic

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[a] All capital outlays have been rounded to the nearest $10.

[b] A complete list of reference sources is given at the end of Section F.

[c] The dollar amounts in parentheses under each category are the capital expenditures in the 1978 budget year.

1977-78 Budget
Population = 8,500

EXHIBIT F-20. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES

City of Price	Thresholds	Capital Outlays[a]	Comments/Explanations	Source[b]
Administration ($50,077)[c]	1978	$15,000	New equipment and building improvements	1978-79 Budget
	12,000 population and increments thereafter	$11,480	300 sq.ft. per 1,000 population @ $37.33 per sq.ft. + $277 (land cost)	DRI, and secondary source[53]
	14,000 population	$1,500,000	Public Works facility	AOG
Police ($5,595)	1979	$10,500	New equipment	1978-79 Budget
	Increments beyond present population	$6,500	1 vehicle per 3,000 population	DRI, based on interview with Tomsic
Fire ($1,712)	1979	$86,100	New equipment	1978-79 Budget
	18,500 population and increments thereafter	$99,200	1 pumper per 10,000 population @ $84,000 each 1 mini pumper per 10,000 population @ $15,000 each	DRI, based on interview with Tomsic

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[a] All capital outlays have been rounded to the nearest $10.

[b] A complete list of reference sources is given at the end of Section F.

[c] The dollar amounts in parentheses under each category are the capital expenditures in the 1977-78 budget year.

EXHIBIT F-20. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

City of Price	Thresholds	Capital Outlays[a]	Comments/Explanations	Source[b]
Streets ($99,189)[c]	1979	$151,400	Road improvements and equipment	1978-79 Budget
	1979	$30,000	1 backhoe	AOG
	1979	$15,000	1 roller	AOG
	10,000 population and increments thereafter	$625,000	5 miles of secondary roads per 1,000 population @ $125,000 per mile	Allen Vorhees & Associates, and Utah Department of Transportation
Drainage	1979	$3,472,650	Drainage system	Secondary source,[54] and interview with Tomsic
	At increments of 10,000 population above 1979 figure	$3,472,650	Addition to system every 10,000 population	Secondary source[55]
Health, Welfare and Recreation ($74,856)	1979	$50,000	Landfill (1/3 of total cost--splitting with Helper and Wellington)	AOG
	1979	$299,100	Construction, improvements	1978-79 Budget
	Library--begin increments 1979	$48,000	3,000 books per 1,000 population @ $16 per volume	DRI, based on interview with Tomsic
	Community park at 12,500 population and increments thereafter	$40,960	3.6 acres per 1,000 population @ $9,784 per acre + $5,760 (land cost)	Secondary sources,[56] and interview with Tomsic

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[a] All capital outlays have been rounded to the nearest $10.

[b] A complete list of reference sources is given at the end of Section F.

[c] The dollar amounts in parentheses under each category are the capital expenditures in the 1977-78 budget year.

EXHIBIT F-20. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

City of Price	Thresholds	Capital Outlays[a]	Comments/Explanations	Source[b]
Health, Welfare and Recreation ($74,856)[c] (cont.)	Neighborhood park one in 1979, one at 12,500 population and increments thereafter	$19,560	2 acres per 1,000 population @ $8,178 per acre + $3,200 (land cost)	Secondary sources,[57] and interview with Tomsic
	Playfield at 12,500 population and increments thereafter	$9,830	1.5 acre per 1,000 population @ $4,950 per acre + $2,400 (land cost)	Secondary sources,[58] and interview with Tomsic
	Playground at 12,500 population and increments thereafter	$37,100	1.5 acres per 1,000 population @ $23,134 per acre + $2,400 (land cost)	Secondary sources,[59] and interview with Tomsic
	Baseball field at 12,500 population and increments thereafter	$55,000	1 field per 3,000 population @ $55,000 per field	DRI, based on interview with Tomsic
	Softball field at 12,500 population and increments thereafter	$28,680	1 field per 3,000 population @ $28,675 per field	Secondary source,[60] and interview with Tomsic
	Tennis court at 16,000 population and increments thereafter	$13,370	1 court per 2,000 population; 0.23 site per court @ $13,000 per court + $368 (land cost)	Secondary sources,[61] and interview with Tomsic

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[a] All capital outlays have been rounded to the nearest $10.

[b] A complete list of reference sources is given at the end of Section F.

[c] The dollar amounts in parentheses under each category are the capital expenditures in the 1977-78 budget year.

EXHIBIT F-20. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES (Cont.)

City of Price	Thresholds	Capital Outlays[a]	Comments/Explanations	Source[b]
Utilities ($316,287)[c]	1979 and increments thereafter	$365,000	1 water storage tank per 8,000 population	AOG
	15,000 population	$100,000	To enlarge and repair main water trunk lines	DRI, based on interview with McArthur
	12,000 population	$100,000	To enlarge and repair main sewer trunk lines	DRI, based on interview with McArthur
Miscellaneous ($119,078)	1979	$6,000	Redo downtown area	Based on interview with Killian
	1979	$15,000	To institute a special improvement district	Based on interview with Killian
	1979	$39,000	Equipment and improvements	1978-79 Budget
	Yearly	$11/capita	An average of the 1977-78 and 1978-79 budget total expenditure	DRI

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[a] All capital outlays have been rounded to the nearest $10.

[b] A complete list of reference sources is given at the end of Section F.

[c] The dollar amounts in parentheses under each category are the capital expenditures in the 1977-78 budget year.

1977-78 Budget
Student enrollment (4th week of
October 1977) = 4,341

EXHIBIT F-21. ASSUMPTIONS USED IN ESTIMATING PUBLIC CAPITAL EXPENDITURES

School District	Thresholds	Capital Outlays[a]	Comments/Explanations	Source[b]
Schools ($1,215,660)[c]	1979	$2,500,000	New classroom buildings	1978-79 Budget
	1979	$283,190	Remodeling of existing buildings	1978-79 Budget
	1979	$500,000	Sites	1978-79 Budget
	1979	$225,000	Equipment	1978-79 Budget
	Increments beyond 4,800 enrollees (i.e. 5,200, 5,600 etc.)	$1,830,360	Expansion of school facilities for each 400 new enrollees based on 100 sq.ft. per new pupil @ $45 per sq.ft. + $30,360 (land cost)	DRI, based on interview with Nelson
Administration ($10,700)	1979	$15,000	Equipment for administration	1978-79 Budget
	Increments beyond 4,800 enrollees (i.e., at 5,800, 6,800 etc.)	$57,800	6 administrative personnel per 1,000 students with 150 sq.ft. per employee = 1,650 sq.ft. per 1,000 students @ $34.27 per sq.ft. + $1,252 (land cost)	DRI, based on secondary sources[62]
Miscellaneous ($144,420)	Yearly	$33/student	Present capital costs per student	DRI

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[a] All capital outlays have been rounded to the nearest $10.

[b] A complete list of reference sources is given at the end of Section F.

[c] The dollar amounts in parentheses under each category are the capital expenditures in the 1977-78 budget year.

EXHIBIT F-22. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, CARBON COUNTY

The Results of Scenarios I and II, Primary Case Study

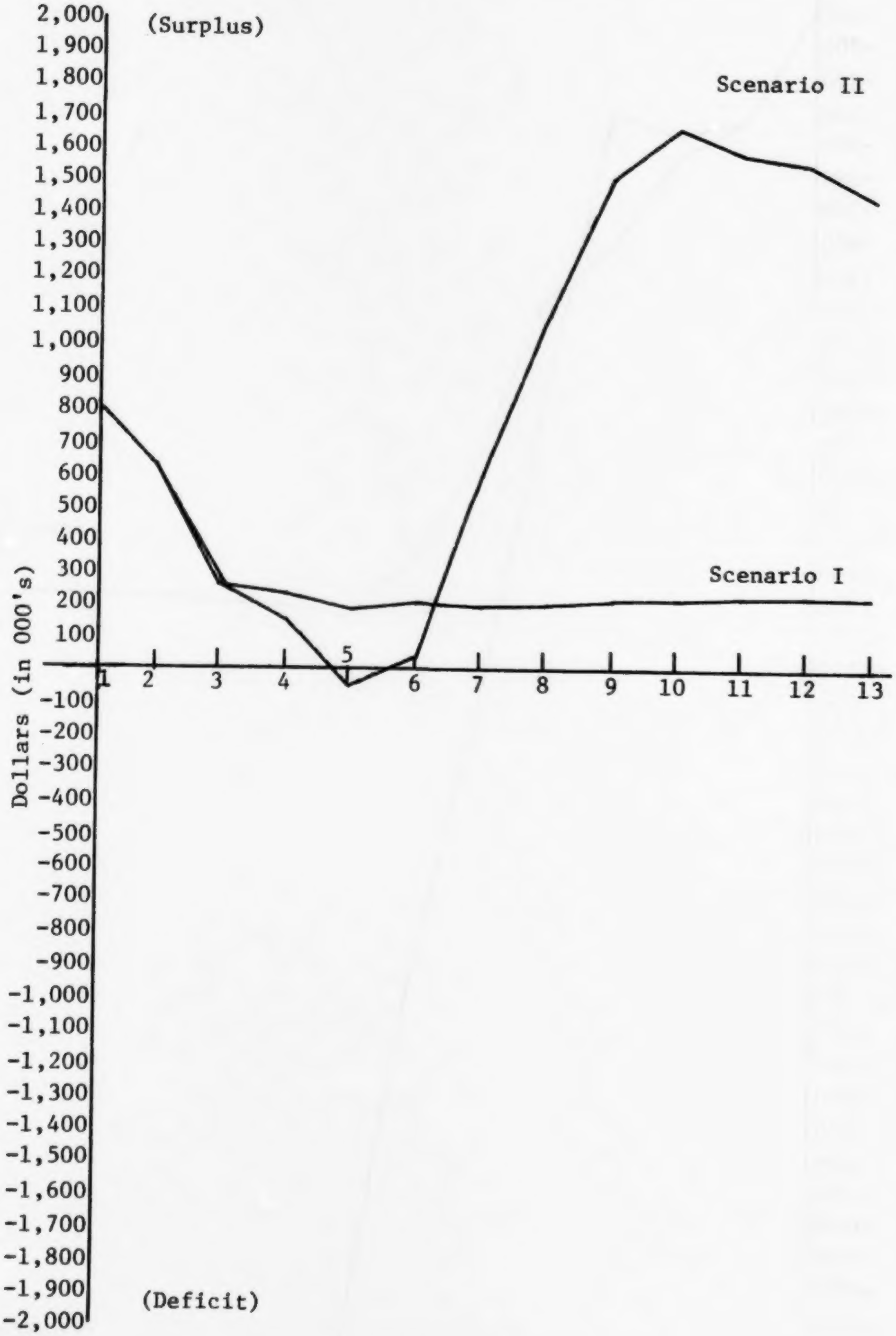


EXHIBIT F-23. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, PRICE

The Results of Scenarios I and II, Primary Case Study

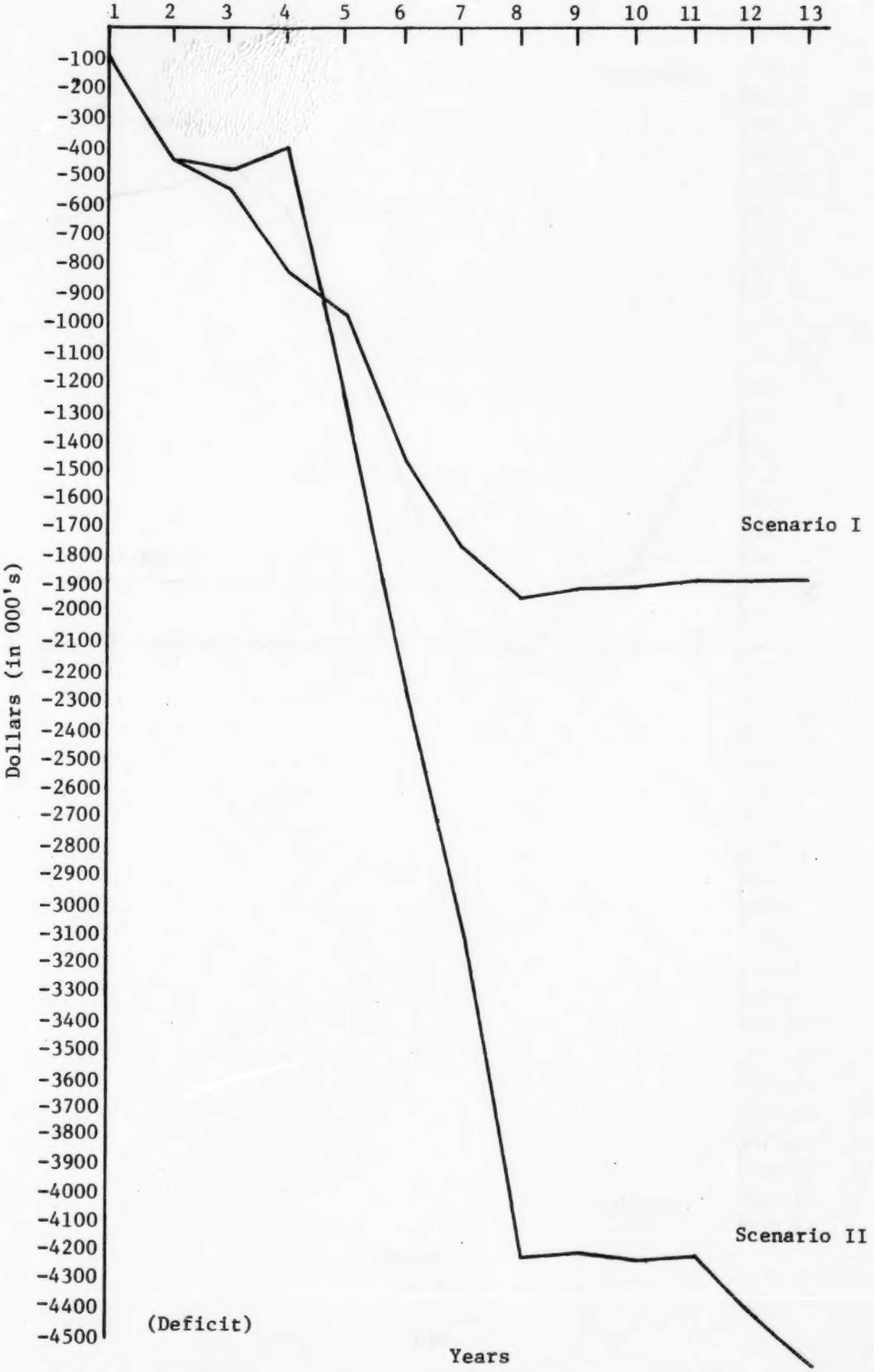
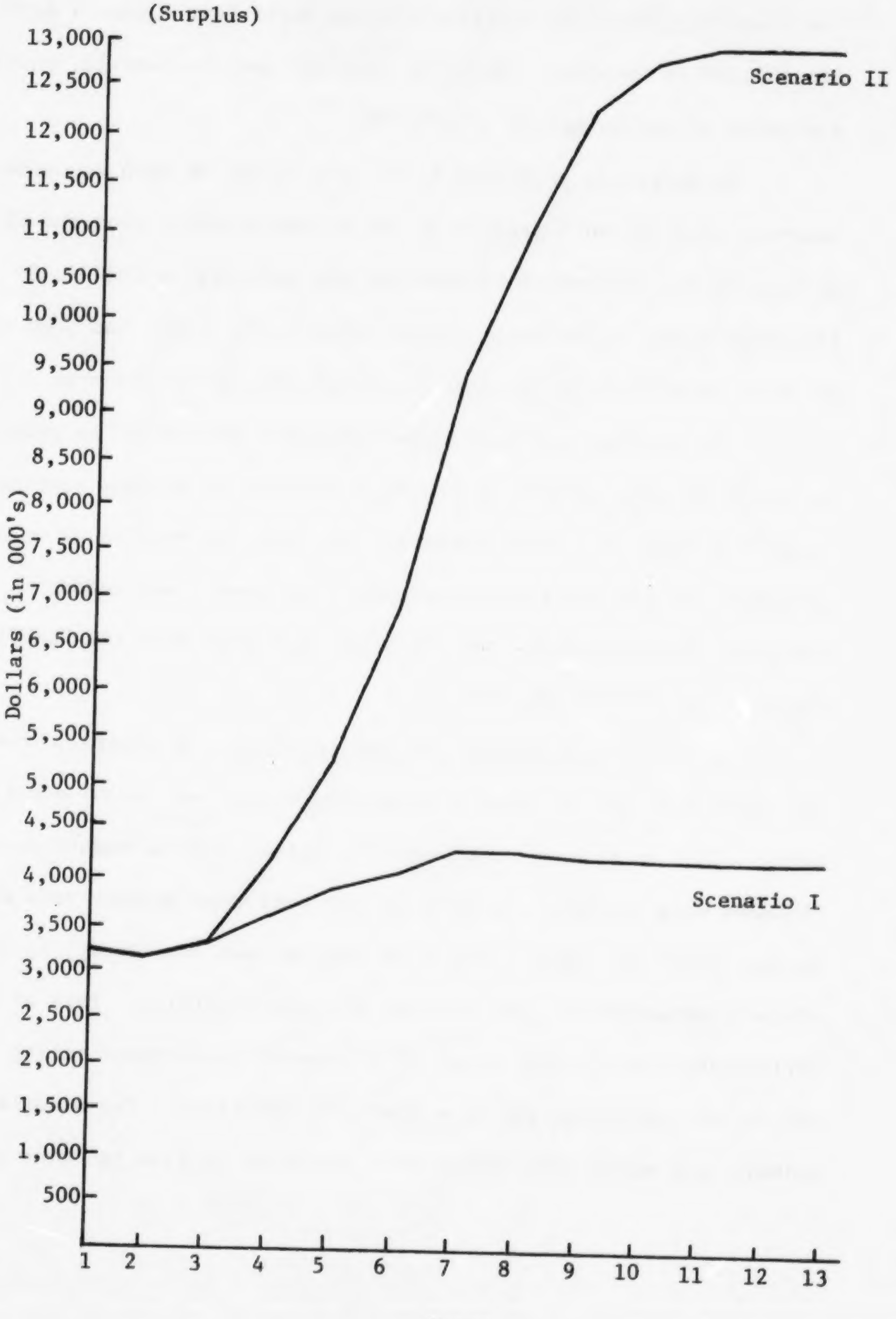


EXHIBIT F-24. COMPARISON OF NET FISCAL SURPLUSES AND DEFICITS, CARBON SCHOOL DISTRICT

The Results of Scenarios I and II, Primary Case Study



entity. In Scenario I, Carbon County always maintains a surplus, which in later years levels off to about $220,000. In Scenario II, the county's financial condition worsens until Year 5 when a deficit of -$56,000 is incurred. Then, it improves and, in Year 13, there is a surplus of approximately $1,450,000.

Deficits are projected in Price's budget in both scenarios. However, they are much greater in the second scenario than the first. By Year 13 the difference between the two deficits is $2,704,707. On the other hand, Carbon County School District's budget has huge surpluses of about $4,270,000 in Scenario I and $12,970,000 in Scenario II.

The city has the most severe problems because it is projected to absorb a large portion of the county's population (see Section E: Geographic Distribution of Impacts), but will not receive ad valorem receipts from the energy developments. The county and school district, while receiving some impacts, will also have the benefit of an increased ad valorem tax base.

Comparison of results and implications. In general, in comparing the results of the two case studies, the county and school district were better off when primary data were used rather than secondary data. City finances were predicted to be much worse off when primary data were used. Because different assumptions were used in each case study, it is impossible to determine all the reasons for this occurring. Part of the explanation lies in the extent of the energy development taking place and in the settlement patterns that were specified. For example, in the primary case study more people were projected to live in Price than when the secondary information was used (see Section E: Geographic Distribution of Impacts).

The prime distinction to be made here is which method produces the most accurate computer inputs. Even though the method used to gather data in the primary case has some problems (i.e., it often relies heavily on the judgments of the interviewer and interviewee), it does result in more precise information concerning the local situation. This fact alone indicates that the fiscal projection for the local jurisdictions will probably be more accurate than those produced using secondary sources.

LIST OF INTERVIEWEES--SECTION F

Dr. Bishop, Utah State Board of Education
Robert Cooper, Property Tax Division, Utah Tax Commission
Raymond Downard, County Assessor, Carbon County
Jessie Holdaway, County Treasurer, Carbon County
Clare Janes, United States Geological Survey, Salt Lake
William A. Jewkes, Financial Officer, Carbon County School District
Burke Johnston, Superintendent, Road Department, Carbon County
Jeffrey Killian, City Administrator, Price
Floyd Marx, County Commissioner, Carbon County
P. Hampton McArthur, City Financial Officer, Price
Dennis Nelson, Superintendent, Carbon County School District
Norman Pritchard, County Clerk/Auditor, Carbon County
Lee Semken, County Commissioner, Carbon County
James Simone, County Commissioner, Carbon County
Gerald Stanton, County Assessor, Emery County
John Stuart, Property Tax Division, Utah Tax Commission, Salt Lake
Gary Tomsic, Director, Southeastern Utah Association of Governments, Price

C. Housing

Increased energy resource development has caused housing shortages and associated problems in the region. These have become some of the most pervasive local issues. In addition to the shortage of housing, the inflated local land and construction costs have pushed the cost of housing beyond the reach of many new families. At least as a partial result of these factors, there has been an increase in the number of mobile homes and factory-built housing in the district. Further hampering the development of new housing in many areas are the inadequate water supply systems and sewer facilities.[63]

Procedure--secondary case study. As indicated in Volume II, Section VII: Housing, the housing methodology combines quantitative analysis of effective housing demand with a qualitative analysis for identifying supply constraints. Applying this methodology to the southeast Utah case study, four tasks for determining effective housing demand were considered: (1) projection of the number of households by income group; (2) estimation of housing costs; (3) translation of housing costs into income requirements; and (4) estimates of effective housing demand. In general, their application in the Utah secondary case study was the same as that used in the Utah primary case study and the Colorado case study. The exceptions are noted below.

First, a projection of the number of households by income group and by employment category was computed. Estimates of total income within each employment category were calculated using mean incomes for each employment group. Employee estimates were converted into number of families and single workers (see Section D: Population and Income). From this an estimate of households, or housing-seeking units was calculated.* Total income was distributed among the households based on the income distribution in the case study area as reported in the 1970 census.

Since there was no secondary data available which provided current housing costs, the costs used in the secondary run were the same as those used in the Colorado case study. Mortgage terms needed to translate housing costs into income requirements were likewise adopted. Exhibit G-1 gives housing costs, mortgage terms and resulting income requirements that were used in the secondary run.

An estimate of effective housing demand (i.e., units both needed and affordable) was determined by combining matrices of (1) the distribution of households by income group and by employment group (described above); (2) income requirements by housing prototypes (described above); and (3) housing prototype preferences by employment groups. Housing preference assumptions are provided in Exhibit G-2. Those who could not afford their preferred type were assumed to settle for the next housing type they could afford. Those whose incomes did not qualify them for any of the housing prototypes, using the standard housing financing assumptions, were assigned to a fifth demand category, "residual demand."

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*Single workers were assumed to double up; families were assumed to contain 1.2 workers per household.

EXHIBIT G-1. PRODUCTION COSTS AND IMPLIED INCOME LEVELS REQUIRED FOR PRODUCTION OF NEW HOUSING IN NORTHWEST COLORADO (AND USED IN THE UTAH SECONDARY CASE STUDY)

	Single Family Standard Construction		Multi-Family		Mobile Home	
Production Costs	Unit construction (1000 sq.ft. @ $33/sq.ft.)	$33,000	Unit development costs:		Park development:	
	Land	1,600	Unit construction (800 sq.ft. @ $29/sq.ft.)	$23,200	Land	$ 750
	Site development[b]	5,800	Land	700	Site development[b]	4,000
	Tap fees	1,350	Site development[b]	3,200	Tap fees	1,350
	Total	$41,750	Tap fees	1,350	Total	$ 6,100
			Total	$28,450	Site rental (15% return on park development costs plus $35 per month operating expenses)	$111/mo.
			Unit rental			
			Owner's debt service	$233/mo.		
			Operating expenses (35% of gross rent)	81/mo.	Unit cost (800 sq.ft.)	$12,000
			Total economic rent required	$314/mo.		
Monthly Costs to Occupant	Mortgage payments[c]	$297/mo.	Rent	$314/mo.	Loan payments[e]	$146/mo.
	Taxes and insurance[d]	92/mo.			Taxes and insurance[d]	31/mo.
	Total	$389/mo.			Site rental	111/mo.
					Total	$288/mo.
Annual Income Required[a]		$18,672		$15,072		$13,824

a. Assumes 25% of gross income available for these housing costs.

b. Includes roads, utilities, grading, and curb and gutter.

c. Assumes 10.5 mortgages for 30 years. A 20% down payment is assumed.

d. 2.9% of total value per year.

e. Assumes 13.5% interest on loan for 10 years. A 20% down payment is assumed.

Source: DRI interviews with Colorado housing developers, realtors, and bankers.

EXHIBIT G-2. HOUSING PREFERENCE ASSUMPTIONS BY EMPLOYMENT CATEGORY

Type of Unit	Energy-Related Construction Workers	Energy-Related Operating Workers and all Others
Single Family	46%	70%
Multi-Family	9%	11%
Mobile Home	38%	17%
Other	8%	1%

Source: Mountain West Research, Inc., Construction Worker Profile Final Report (Washington, D.C.: Old West Regional Commission, December 1975).

Estimates of demand for each category were also translated into implied new units of construction. These two estimates--effective demand and implied new units--are the same during periods of constantly increasing demand. During years where demand is falling, implied new construction is zero and remains zero until any excess units previously constructed are absorbed.

Results--secondary case study. Housing demand under Scenario I (which assumes a lower level of coal development) is far less than demand under Scenario II* (see Exhibit G-3). Residual demand and the demand for single family housing show the greatest relative increase. All other categories of demand increase by small increments. Under this scenario, developers would continue to produce new housing (especially single family), but at a moderate level.

The resulting forecasts of effective housing demand under Scenario II for Carbon County are given on Exhibit G-4. In general, in Scenario II, housing demand is fairly uniform with the exception of increasing demand during Years 3 through 8. Single family demand is about six times as great as the number demanding multi-family, mobile homes, or other. Residual demand (i.e., those whose incomes do not qualify them for any of the housing prototypes) is the second largest after single family demand. By Year 13, demand for other types of housing is the smallest.

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*Existing number of housing units was included in Year 2 through Year 13 throughout this section. There were approximately 4,844 single family units, 389 multi-family units, and 961 mobile homes in Carbon County as of September 1976.[64]

EXHIBIT G-3. HOUSING DEMAND, CARBON COUNTY

The Results of Scenario I Using Secondary Data

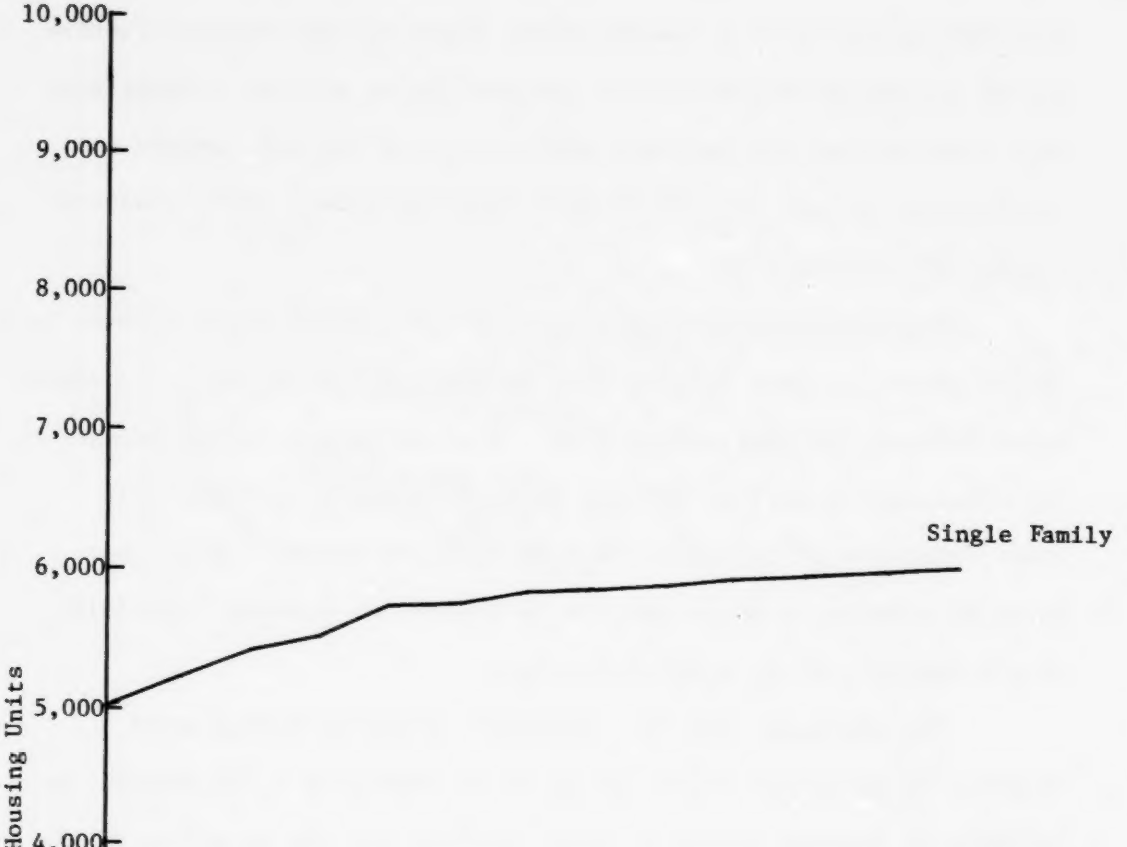


EXHIBIT G-4. HOUSING DEMAND, CARBON COUNTY

The Results of Scenario II Using Secondary Data

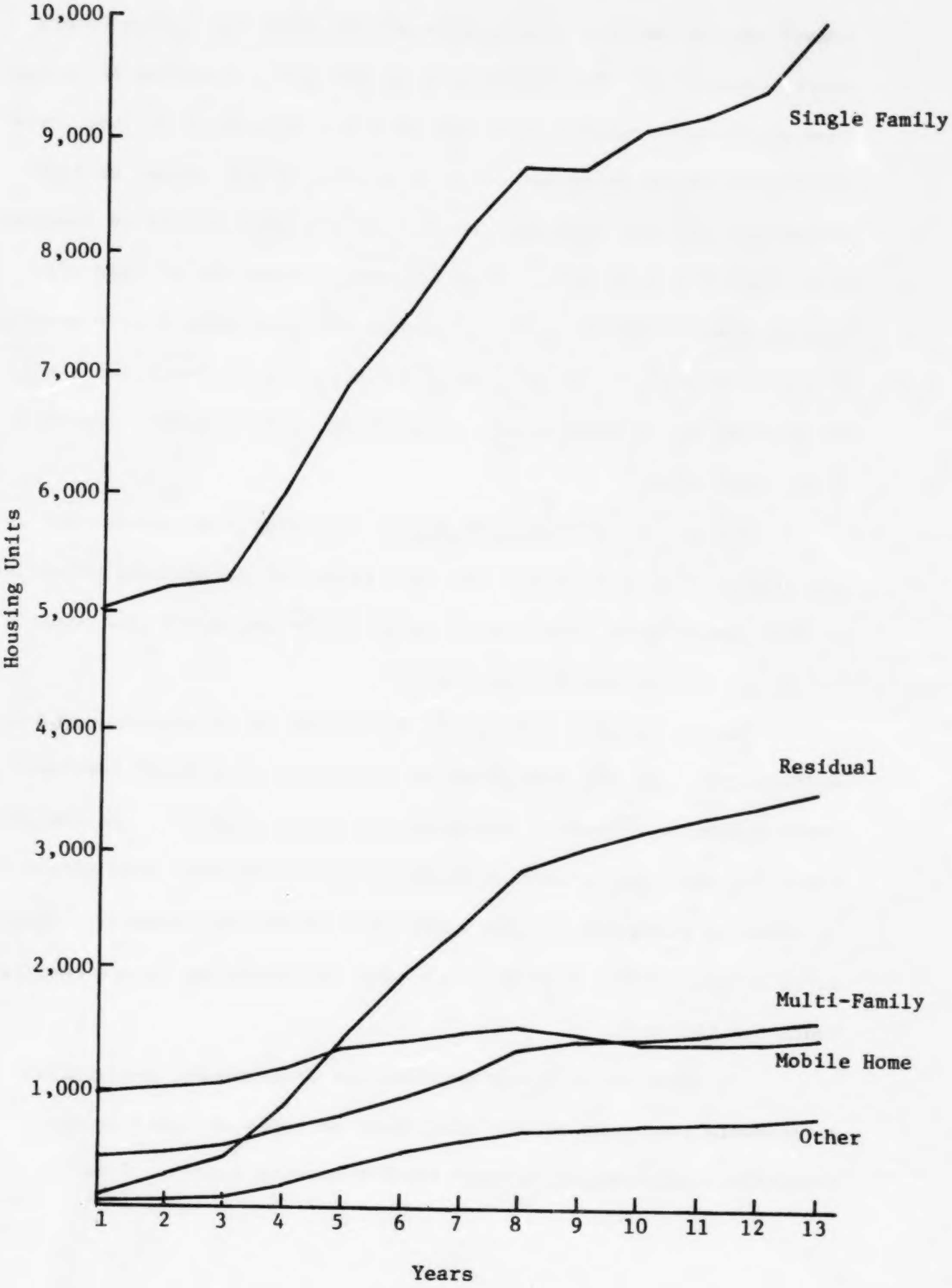


Exhibit G-5 shows the differences between effective housing demand and the implied construction of new units for Carbon County under Scenario II. The comparisons of two interpretations of demand show years where vacancy rates may be high, reflecting periods where developers may be reluctant to build because of the danger of high vacancies. As seen from the results, by the later stages of development (Year 8 through 13), demand for mobile homes has slacked off, leaving some vacant units in the county (if they haven't been moved out by their owners). Outside of mobile homes, any new units built will be absorbed by the population. Thus, under this scenario, housing will remain tight.

Procedure--primary case study. Applying this methodology to the primary Utah case study, the four tasks for determining effective housing demand were identical to those in the secondary case study except for estimating housing costs.

In the primary case study, an estimation of housing costs in southeastern Utah was made based on interviews with local developers, local builders, financial institutions, and/or realtors. At the same time, the most appropriate mortgage terms for the area were determined in order to translate housing costs into income requirements. Exhibit G-6 gives housing costs, mortgage terms and the resulting income requirements for the area.

In addition to these quantitative assessments, qualitative assessments were made of the likelihood of types of institutional constraints which might further inhibit housing supply. This

EXHIBIT G-5. COMPARISON OF HOUSING DEMAND WITH NUMBER OF NEW UNITS, CARBON COUNTY

The Results of Scenario II Using Secondary Data

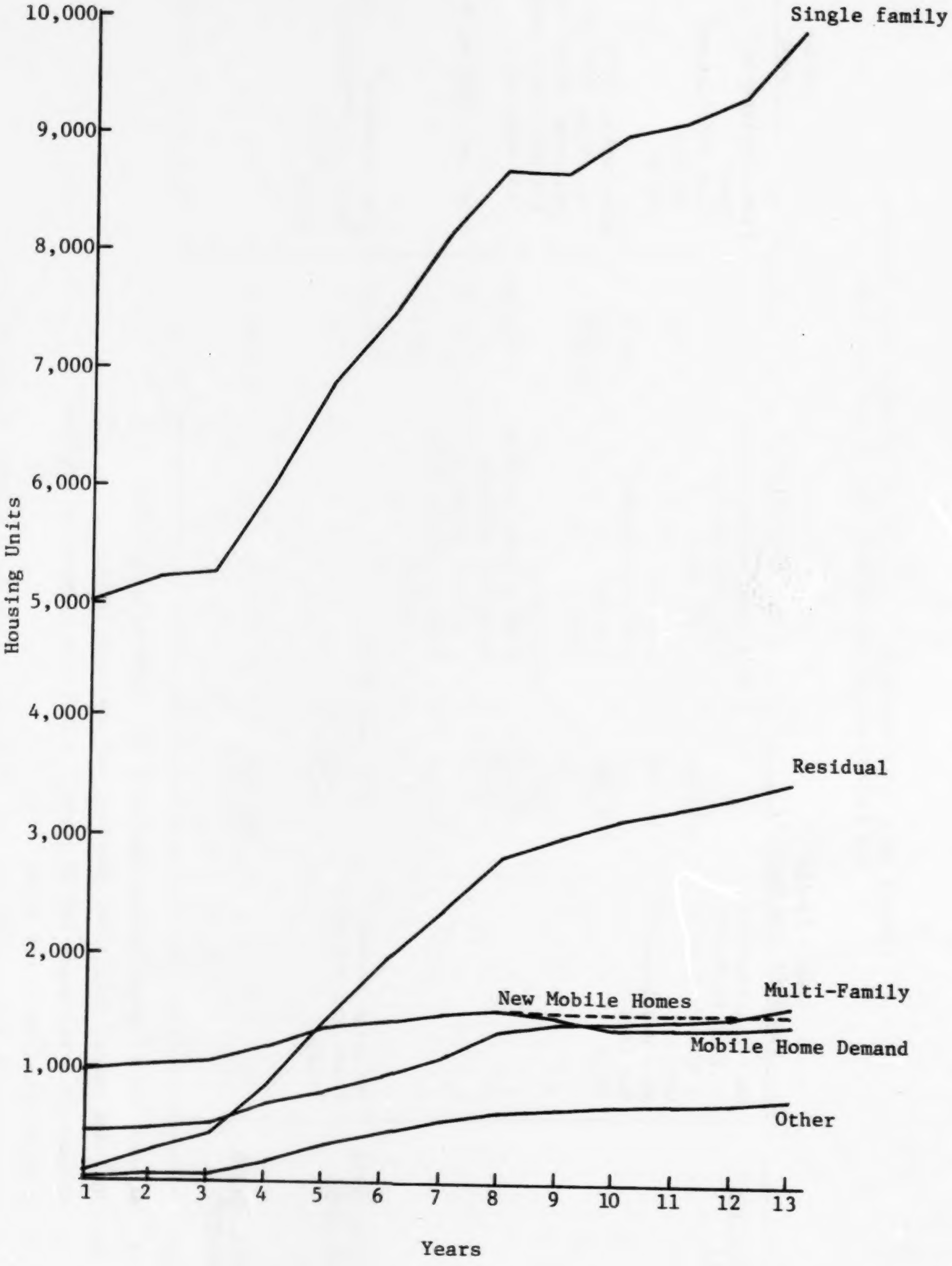


EXHIBIT G-6. PRODUCTION COSTS AND IMPLIED INCOME LEVELS REQUIRED FOR PRODUCTION OF NEW HOUSING IN SOUTHEASTERN UTAH

	Single Family Standard Construction		Multi-Family		Mobile Home	
Production Costs	Unit construction (1000 sq.ft. @ $39.25/sq.ft.)	$39,250	Unit development costs:		Park development:	
	Land and Site development[b]	10,000	Unit construction (600 sq.ft. @ $34.50/sq.ft.)	$20,700	Land	$ 750
	Tap fees	750	Land and Site development[b]	4,350	Site development[b]	4,000
	Total	$50,000	Tap fees	950	Tap fees	1,350
			Total	$26,000	Total	$ 6,100
			Unit rental		Site rental (15% return on park development costs plus $35 per month operating expenses)	$111/mo.
			Owner's debt service	213/mo.		
			Operating expenses (35% of gross rent)	74/mo.	Unit cost (800 sq.ft.)	$12,000
			Total economic rent required	$287/mo.		
Monthly Costs to Occupant	Mortgage payments[c]	$356/mo.	Rent	$287/mo.	Loan payments[e]	$146/mo.
	Taxes and insurance[d]	110/mo.			Taxes and insurance[d]	31/mo.
	Total	$466/mo.			Site rental	111/mo.
					Total	$288/mo.
Annual Income Required[a]		$22,362		$13,774		$13,824

a. Assumes 25% of gross income available for these housing costs.

b. Includes roads, utilities, grading, and curb and gutter.

c. Assumes 10.5 mortgages for 30 years. A 20% down payment is assumed.

d. 2.9% of total value per year.

e. Assumes 13.5% interest on loan for 10 years. A 20% down payment is assumed.

Source: DRI interviews with Utah housing developers, realtors, and bankers.

assessment was based on interviews with regional bankers, planners, and the local housing authority.

Results--primary case study. Housing demand under Scenario I (see Exhibit G-7) peaks during the mid-years of development and then decreases by Year 13. Since demand increases during the early stages of development, this seems to reflect a temporary expansion in the basic and nonbasic work force. If energy development occurs as projected in Scenario I, developers might not produce enough housing when needed because of the possibility of future vacancies.

The resulting forecasts of effective housing demand under Scenario II for Carbon County are given in Exhibit G-8. Demand for all housing increases rapidly through Year 7. After Year 7, demand drops off temporarily, then increases again, but more moderately. Single family demand is by far the largest, followed respectively by mobile home, multi-family, and other. Residual demand is high under this scenario, indicating a large proportion of residents who are still unable to afford any of the four housing prototypes.

Exhibit G-9 shows the differences between effective housing demand and the implied construction of new units for Carbon County under Scenario II. Vacancy rates begin to appear for all four housing prototypes by Year 7, and in the case of multi-family units, remain through Year 13. Thus, in years where vacancy rates may be high, developers may be reluctant to build any more new units.

From interviews concerning potential institutional constraints, it appears that the housing supply response in southeastern Utah will primarily be hampered in some areas by an inadequate community infrastructure

EXHIBIT G-7. HOUSING DEMAND, CARBON COUNTY

The Results of Scenario I Using Primary Data

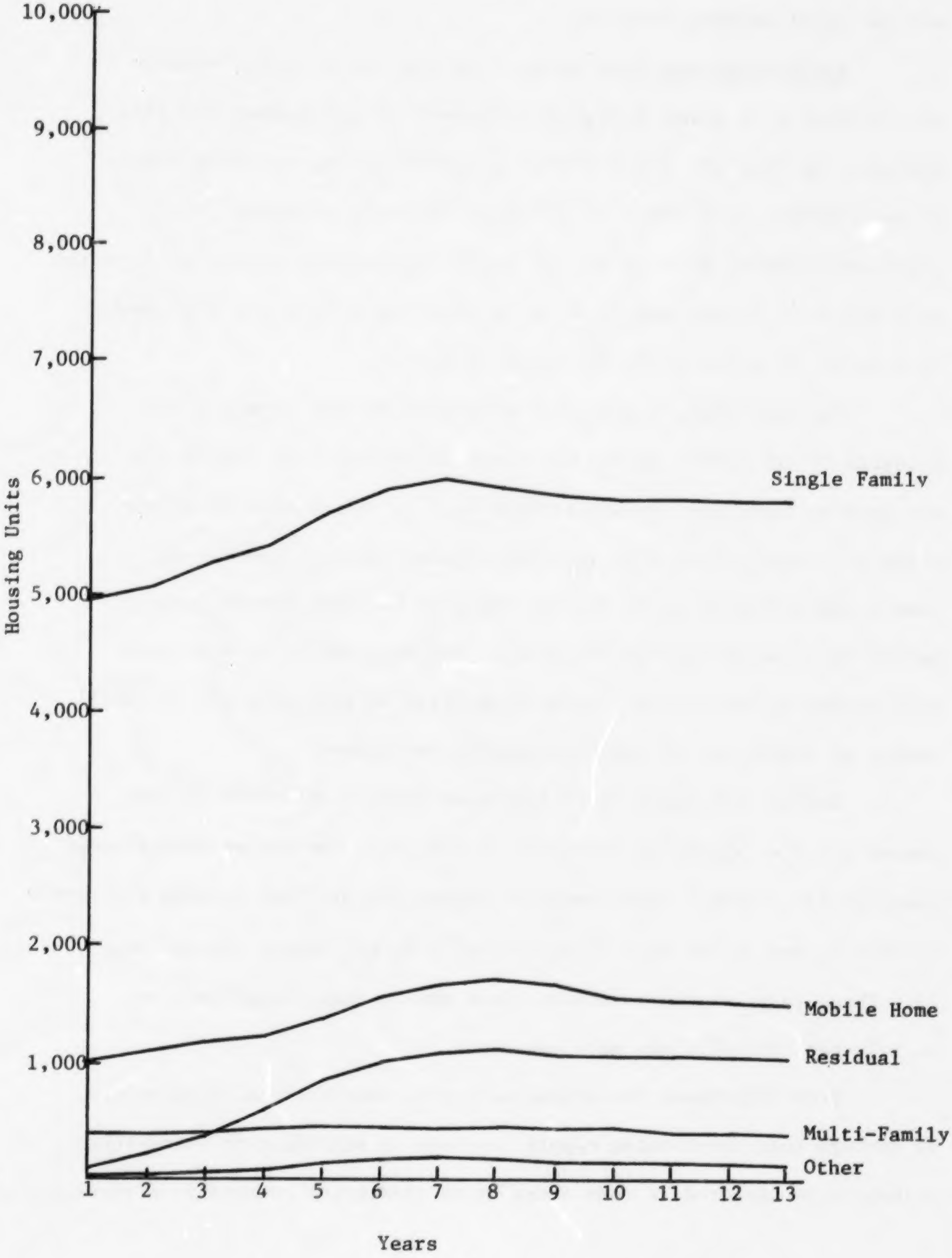


EXHIBIT G-8. HOUSING DEMAND IN CARBON COUNTY

The Results of Scenario II Using Primary Data

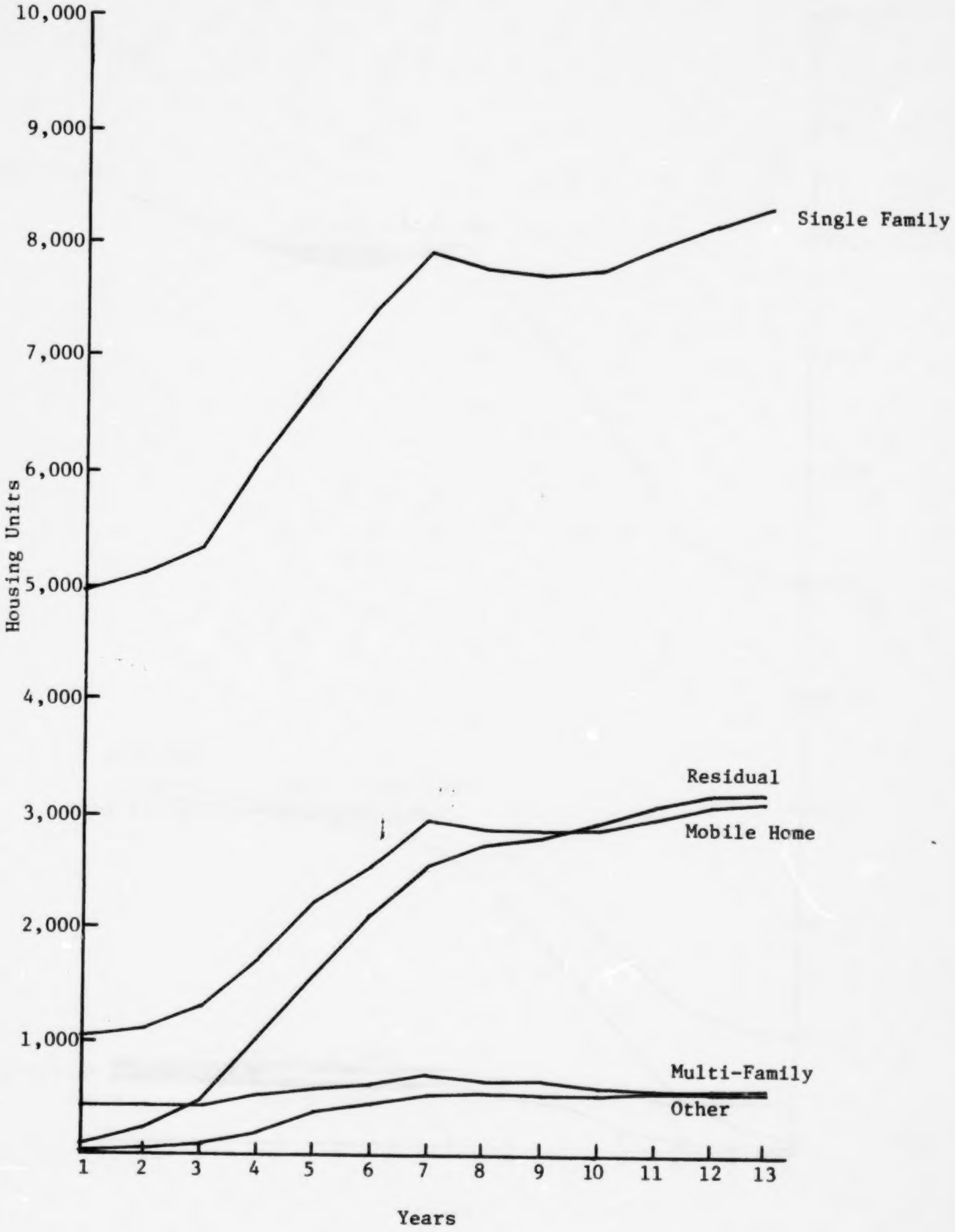
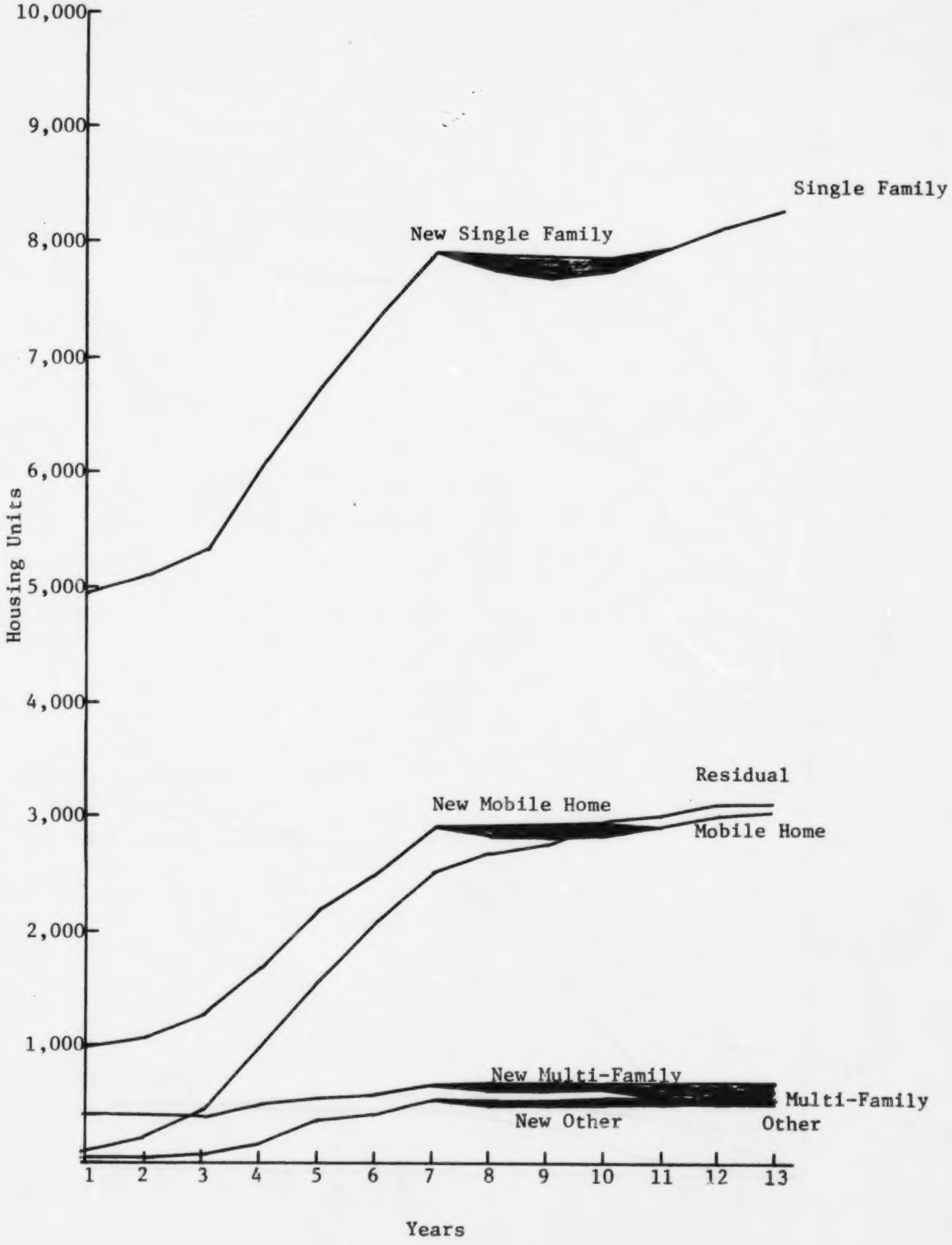


EXHIBIT G-9. COMPARISON OF HOUSING DEMAND WITH NUMBER OF NEW UNITS, CARBON COUNTY

The Results of Scenario II Using Primary Data



(i.e., water supply and distribution system, sewage treatment, roads). This problem, in turn, has increased development costs and risk. In particular, inadequate water and sewer facilities in Emery County is a major constraint in the near future. This is illustrated by the fact that every community in that county is presently in need of an improved water or sewer system and most are involved in or pursuing major projects to alleviate this situation.[65] As a result, water and sewer hook-ups for new housing are scarce, or in some cases, not available. In the long-term, water availability in the entire region is likely to be a constraint to housing development. Developers must acquire expensive water shares, which push up the cost of site development. At the time of this writing, the price of a lot in a Price subdivision was about $10,000.

Although construction, commercial and mortgage credit is available, high interest rates and down payments make it more difficult to qualify for financing.

The unavailability of residential contractors to meet anticipated future housing demand is already a serious problem in Emery County. Competition for contractors from the energy industry and Carbon County commercial developers is part of the reason for this shortage.

As a result of these constraints, there is growing dependence on mobile and modular homes, especially in Emery County. A recent survey showed that mobile homes comprised 41 percent of the total housing stock in Emery County, 37 percent in Grand County, and 15 percent in Carbon County. Although it appears that the quality of the mobile home units is adequate, poor mobile home park planning remains a problem. Parks have very few basic amenities and are scattered throughout the area.[66]

Carbon and Emery Counties are acutely aware of the housing problem and are attempting to upgrade and expand public services in order to accommodate future housing demand. In addition to water and sewer facilities, roads and medical facilities are being given high priority. In the immediate future, it appears that Carbon County, and Price in particular, will be better able to supply new housing, since the existing infrastructure is in relatively good condition.

Comparison of results and implications. When comparing the results of using secondary and primary data to forecast effective housing demand in Carbon County under Scenario I, the differences are not as great as those under Scenario II (see Exhibits G-5 and G-9). When primary data were employed, housing demand is shown to increase during the mid-years, then decrease slightly. Demand for housing is much more incremental when secondary data are used. It appears then, that the primary case study is generally more sensitive to exogenous factors that could affect housing demand.

In comparing the results of housing demand under Scenario II, there is at least one noticeable difference. Scenario I (secondary data) does not reflect the growing demand for mobile homes (see Exhibit G-3). It shows the demand for single family units to be far greater than under Scenario II, primary data (see Exhibit G-7). These results are misleading, considering the supply constraints which were discussed previously.

Exhibits G-4 (secondary data) and G-8 (primary data) compare housing demand with new housing units (both under Scenario II) in order to show periods where vacancies may exist. As shown with secondary data, vacancies would exist only for mobile homes during the last years of development. In contrast, when primary data are used, vacancies would exist during the mid-years of development, in general for all four housing prototypes. These differences seem to reflect the level of accuracy of the population projections (which are directly related to the energy industry's development plans).* The implications of these two very different sets of results are significant for decision-making by local residential developers. Under secondary data outputs developers may not be as willing to produce new housing as when primary data were used.

The estimating techniques used to assess housing problems are crude. Estimating errors can be expected in housing costs, in household incomes, and in the relationship between costs and incomes even when primary data are collected. Needless to say, the error rate will be much greater where secondary data (e.g., data from another community) are used. The exhibits included in this section serve to illustrate the wide disparity in results. Thus, if the results are to be used for decision-making, it is highly recommended that data on housing costs and household incomes be collected from the study area itself. In addition, since these variables can change over a short period of time, recontacts should be made just prior to entering the data into the computer.

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*See Section A: Description of Energy Development.

The presence of a large "residual demand" category found in the primary case study is a warning that even an efficiently functioning private housing market is unlikely to meet the housing needs of newcomers to the area. The institutional constraints which exist offer further evidence that this will be the case. In order for housing mitigation strategies to be effective in southeastern Utah, they should address: (1) removing institutional barriers (e.g., inadequate community infrastructure and lack of skilled contractors); and (2) altering the present relationship between new housing costs and new residents' income.

H. Sociocultural Impacts

As discussed in Volume II, Section IX: Sociocultural Impacts, the sociocultural changes that an energy-impacted community undergoes are likely to be profound. Identifying these changes, however, is done with great uncertainty, because societal change is usually qualitative and evolutionary in nature. The methodology applied in the southeastern Utah case study uses a step-by-step approach for moving from impacts identification to monitoring and forecasting. (Demonstrated in Exhibit H-1.)

Because of the nature of this assessment process, it could be done only on a primary case study basis. Therefore, no secondary data analysis was attempted and results from the primary case study were used where appropriate.

Procedure. First, an initial listing of categories of societal change was developed by combining those models used by Daniel Bell[67] and EPA Fellows.[68] The checklist was then modified to reflect parties-at-interest perspectives.*

As discussed in Volume II, Section IX: Sociocultural Impacts, a series of causal relationships are assumed. These link societal changes to potential impacts, as affected by characteristics of the existing environment and of the proposed energy development. Exhibit H-2 demonstrates the causal relationships. Briefly, the linkages are:

A. Changes in social structure directly affect the state of the polity and culture.

B. Changes in social structure affect individuals, and human institutions such as families, human support systems, and communities (in both size and cohesion).

C. Changes in polity and culture affect individuals, families, human support systems, and communities.

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*See Section I: Identifying and Analyzing Other Impacts for a list of parties-at-interest.

EXHIBIT H-1. INDICATORS OF SOCIETAL CHANGE--CARBON AND EMERY COUNTIES

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
CATEGORY: ECONOMIC					
Work Satisfaction	Increased opportunity may exist for those who are presently underemployed and/or those residents just entering the work force	High existing underemployment of local residents High net out-migration rates for 18-22 year olds--*Some young males returning to communities, other cases of young males and females staying because of increased job opportunities*	Match between skills required in new high paying jobs and skills of local residents--*The College of Eastern Utah has a mine safety program which perspective miners must complete* Energy industry use of affirmative action guidelines in employment practices	Change in labor participation rates Change in out-migration rates for 18-22 age cohorts Change in actual enrollment in vo-tech classes and interest expressed by high school graduates	Energy development benefits relatively few pre-development residents (Classes 1,2&3)
	Changes in working or living conditions may result in increased job dissatisfaction (e.g., stresses away from work may affect job satisfaction)	Physical and social environments which are unusual and unlikely to appeal to many newcomers (e.g., arid plains area)--*Much of Carbon and Emery Counties are open plateau land which is dry, completely undeveloped and isolated*	Newcomers or local residents making sharp career changes (e.g., teachers and ranch hands becoming underground miners)--*Many old-time residents were coal miners until coal activity slowed down in the 50's and 60's; when coal mines reopened some workers went back into the mines; also cases of teachers, janitors, etc., going into mines for first time* Degradation of quality of life as community expands (e.g., inadequate housing and public service delivery)--*Housing market tighter in Emery County; new construction has been slow to start there*	Change in absenteeism and turnover rates Change in worker productivity Opinions expressed by energy-related workers and employees of social service agencies regarding case loads	Forecast uncertain, however, threat of increased job dissatisfaction exists (Classes 2 & 3)
	Job opportunities for women may be limited (e.g., sales and clerical work)	Prevalence of attitudes discouraging participation of women in the work force--*More women working now because of economic necessity; however, traditional values prevail and there is a sharp distinction between accepted male roles vs. female roles*	Introduction of female newcomers (e.g., wives of construction workers) who are seeking paid employment--*Female newcomers can eventually find employment, the new energy-generated jobs are typically secretarial, clerical, or in retail establishments*	Changes in unemployment statistics for skilled and unskilled female applicants Opinions of women interviewees that jobs are easier or more difficult to obtain	Eventually, a greater proportion of women who live in the community will work (Classes 2 & 3)

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Work Satisfaction (cont.)		Absence of institutional support systems for working women (e.g., day care)--*In Carbon County the number of private and public day care centers appears to be just adequate; in Emery County this function is handled by the LDS church or among families and neighbors*	Existence of sex discrimination in energy-related jobs--*Unknown* Creation of a small number of nonbasic jobs relative to the number of new basic jobs--*Future nonbasic/basic multiplier will be lower* Possibility of restrictive mining practices by some energy development industries (e.g., sex discrimination on the basis of potential health hazards)	Number of women hired by energy industries Opinions expressed by women who would enter job market if support systems in place and by those unsuccessful in obtaining employment	Family and individual emotional problems will increase, unless provision is made for working women and women new to community (Class 2)
Income Distribution	Higher paying jobs in energy industry may be taken by newcomers (perhaps leaving old-timers actually worse off as a result of local inflation)	Available labor pool in small community may be limited--*Outside of the younger local people just entering the labor force, the pool of local labor suitable/willing to go into mining has been absorbed*	Newcomers qualified for skilled and semi-skilled energy jobs--*A substantial number of newcomers into the area for mining jobs; however, inexperienced miners are usually required to complete a mining safety program offered at the College of Eastern Utah in Price (there has been a waiting list for the program)*	Opinions by energy officials, survey data, or actual employment data indicating that energy jobs are going to newcomers Subjective assessments by old-time residents that cost of living is higher	Older, fixed income residents are apt to suffer hardships (Class 2)
	Occurrence of wage differential between energy and local service jobs (possibly increasing income inequality in community)	Income distribution which is established and has remained relatively stable--*With the exception of the 1940-1950 period when there was some expansion of coal mining in the area causing incomes to change, distribution has been relatively stable*	Local service employers must compete with energy industry for employees (e.g., police officers seeking energy jobs) possibly driving up wages in government and service sectors--*Price City in Carbon County has had some turnover (one source estimated 20 percent); secretaries, maintenance personnel, bus drivers, and a few teachers have left the Carbon County and Emery County schools for jobs in energy; two former nurses are now miners, etc.*	Earnings per employee by employment sector--*E.g., as of 1977 average annual income in Carbon and Emery Counties was more than three times as great for miners than for service employees ($18,390 vs. $5,733 in Carbon, and $16,676 vs. $5,720 in Emery)* Changes in turnover rates in local service sectors Subjective assessments by local business people regarding wage rates and employee turnover; job vacancies posted with state employment services	Degraded local services (Classes 2 & 3)

(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Economic Opportunity	Opportunity for higher wages	Income levels which are established and have remained relatively stable	Introduction of higher paying energy jobs--*Per capita income under Scenario II (primary data) for Carbon and Emery Counties was projected to increase from $5,457 in Year 1 to $7,213 in Year 13, or a relative increase of 32%*	Change in per capita incomes	Increased per capita income (Class 1)
	Increased entrepreneurial opportunities	Level of goods and services available in very small communities--*The Price City area of Carbon County is still the regional shopping area, thus variety is much greater there than in the small Emery County towns*	Newcomers making demands for more goods and services--*In the past few years the number of retail stores (including chain stores and restaurants) and motels have increased in the Price City area due to increased demand; a few new motels, convenience stores, and restaurants have opened in Emery County*	Change in the retail trade and service sector (i.e., number of new businesses and employees) Subjective assessments by old-time businesspersons that there are more business opportunities	Expansions of existing businesses and opening of new establishments (Classes 2 & 3)
	Possible displacement of old businesses by major retailers	Predominance of small-scale, locally owned retail stores--*In the area, most retail stores are family run/locally owned*	Newcomers making demands for more goods and services Tightening of local commercial credit availability as growth becomes too rapid	Major retailers entering area (e.g., supermarkets, fast food restaurants)--*E.g., in Price City one of the state's largest Safeways opened, also a new Skaggs drug store (first Skaggs in history to show profit in first quarter), and plans for a Holiday Inn motel and convention center* Closing or sale of locally owned businesses (e.g., neighborhood market)--*As demand for goods and services increased in Carbon County, major retailers have come into the community; the lower prices and stiff competition caused a few locally owned stores to go out of business (e.g., a dry goods store which was one of the oldest businesses in the area and a family owned drug store)*	Displacement of pre-development middle class (Classes 2 & 3)

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Regional Economic Security	New energy development may change the economic diversity of an area whose economy previously was based on agriculture or light industry	Degree of diversity in local economy--*Both Emery and Carbon Counties' economies have been and still are based primarily on coal production, there is also some agriculture; Carbon County is more economically diverse than Emery County because of Price City's role as the area's shopping/service center which includes some light manufacturing*	Size of new energy development Duration of new energy developments--*The duration of the most recent upswing in coal production is uncertain based on conditions of demand for low-sulphur western coal, reinstatement of federal leasing of land for development, etc.* Potential of new energy development to attract linked industry and increase activity in other sectors--*E.g., manufacturing employment in Carbon County increases 219%, while trade and services increase 84% and 76% respectively, in Emery County*	Change in variety of products for external markets Change in economic stability (e.g., less volatile to cyclical fluctuations as may be found in agriculture)	Potential for diversification of local economy (Classes 2 & 3)
	New energy development in an economy based on mineral extraction may reduce the diversity and stability of the economic base	*The diversity of the area's economy has traditionally been minimal due to its reliance on the coal industry and lack of a good transportation network which seems to have hampered most industrial and in some ways agricultural development*	New energy development which is of limited and/or uncertain duration and which is very large relative to the existing economic base--*Most residents in the two counties welcome the increase in mining activity, however, a few have expressed concern that development and its related growth is being accepted too readily and the economy will be even less stable when coal production drops off*	Lack of alternative employment and local government revenue sources Periodic fluctuations in basic employment	Greater or lesser economic specialization, dependence on market for depletable and technologically vulnerable resources (Classes 1 & 2)

(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors--Existing Environment	Contributing Factors--Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
CATEGORY: SOCIAL					
Social Relations	Present social roles and leadership styles (particularly for old-timers) may not be viable in a larger community with many newcomers	Existence of a well-defined social order (e.g., a ranching elite)--*Emery County is a very ethnocentric, homogeneous community because of its strong ties to the LDS church--social functions and other activities center around the church; Carbon County is much more diverse and includes several identifiable ethnic groups (i.e., Greeks and Italians comprise about 10% of total population; Mexicans about 10%), older families (3rd and 4th generation) have also had a great role in the development of the community; the social order in Carbon County is more spread out among these different groups*	Large numbers of newcomers with different characteristics from local residents (e.g., income, age, education and skills)--*Many of the newcomers in Emery County are not members of the LDS church* Introduction of industrial/corporate role structure into community (e.g., multi-level managerial positions)	Creation of new roles (e.g., new businesses) Old roles redefined (e.g., merchant or social worker adapting to new situation) Newcomers replacing old-timers in existing roles (e.g., business, political offices) Elimination of old roles (e.g., Ma & Pa grocery store)	More varied leadership (Class 3) More bureaucratic relationships (Class 3) Changes in style of governmental decision-making (Classes 2 & 3)
	Loss of informality in relationships may occur as community becomes larger	Existence of great degree of informality--*Particularly true in the very small towns in Emery County; a number of old families in Carbon County who have known each other for generations*	Large amounts of population growth--*A frequent remark made in Carbon County is "I don't know half the people anymore"* Increasing trend toward urbanization--*E.g., role of the building inspector has become more formal in Carbon County, now there is a Board of Adjustments for variance on building codes*	New procedures for credit applications Requirements for ID's to cash checks Resume/form requirements for job applications Contracts	Relationships become more formalized (Classes 2 & 3)
Education	Increased demand for greater educational opportunities and/or increased need for remedial programs	Fiscal capability of school system to provide new services and/or functions--*In Utah local district revenues are primarily from property taxes and the State Minimum School Program; the school district can also receive assistance through the State's Building School Houses Act which allows school districts to raise*	Newcomers with different educational needs--*Increased need for more remedial and special education classes, partly because many newcomers begin school mid-year (children of construction workers who may move frequently in one year often have a difficult time catching up in school)*	New programs and opportunities (e.g., adult education and special education)--*A student advocate group was formed in the Jr. High in Carbon County to help students (especially new ones) adjust* Change in participation in PTA-type organization and	Changes in school curriculum (Classes 2 & 3)

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Education (cont.)		*money for school construction that is caused by the development of new industrial plants that require large numbers of workers for their construction and operation; other options include lease-purchase agreements with private builders; if the school cannot find builders then a lease-purchase agreement with industrial plant developers is possible*		school board election processes	
	Quality of educational opportunities may decrease due to strains on capacity of facilities and shortage of professionals	Condition and capacity of existing facilities and adequacy of staff--*In Carbon County present enrollment is about 4,400 students with an overall capacity of 4,800; the elementary schools are at capacity now and the high school has the most excess capacity. The Emery County schools do not have much excess capacity, this is especially true at the elementary schools; a new high school is needed because of structural problems at the existing one in Green River--a $6.5 million building improvements project built and expanded facilities only a few years ago but plans for expansion are needed again; a teacher shortage in Emery County is particularly troublesome as a result of the higher paying energy jobs in the county* Fiscal capability of school system to expand--*(See notes on capacity of existing facilities)*	Possible lag in school tax revenues from newcomers and energy industry Age distribution of new students different from that of old students--*Of the newcomers that have already arrived with school age children, most of them are in the primary grades*	Change in student/teacher ratio Change in truancy, discipline problems Use of temporary buildings and double shifts Turnover of teaching staff	Degraded quality of public school education, including under capacity of facilities and lack of financial resources (Classes 1,2&3)

(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Education (cont.)		Quality and variety of existing programs and educational opportunities--*The College of Eastern Utah in Price offers a variety of evening courses for credit and non-credit; also they offer a mine safety program which awards a certificate upon course completion (6 weeks)*			
Health and Safety	Quality of health care may be reduced due to strains on capacity of facilities and shortage of medical professionals	Conditions and capacity of existing facilities and adequacy of staff--*Carbon Hospital, the largest health facility in S.E. Utah (75 beds) is severely limited by its limited number of physicians; Emery County has a clinic but no hospital and residents must go to Price or Provo for hospital care* Fiscal capability of health care system (e.g., hospitals, clinics) to expand--*Carbon Hospital is being sold to the Hospital Corporation of America, which has plans to build a new (larger) hospital* Likely attractiveness of community to new health care professionals--*Efforts to recruit new doctors in the area have been moderately successful to date (one factor causing this is the reluctance of doctors' spouses to move into the area); there is also a serious shortage of nurses which could be alleviated if the College of Eastern Utah can begin an associate program for RN's*	Large number of newcomers needing health services--*Some companies contribute health care facilities and staffing costs and also have their own emergency first-aid facilities* Possible increase in occupational hazards	Change in the number of doctors per 1,000 population Subjective assessment by local residents of increased difficulty in obtaining medical services (e.g., longer waits for doctor appointments) Opinions of local health care officials regarding staffing problems	Health care facilities and professional staff overload (Classes 2 & 3)

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Health and Safety (cont.)	Fear for personal safety, particularly among old residents, may increase due to rise in crime	In small communities safety is fostered by informal mechanisms (e.g., neighbors taking care of each others' property)--*Long time residents perceive the area as safe, and a good place to raise children; crime rates per 1,000 population have increased, now 36 per 1,000 population in Emery County and 22 per 1,000 population in Carbon County* Limited recreational activities for younger residents--*In both counties mostly outdoor activities and sporting events; also the LDS church provides activities for its younger members* Adequacy of staff and condition and capacity of existing facilities for formal law enforcement--*The jail facility in Price is inadequate to handle present population; the Price Police Department has increased its staff incrementally (one person/year); a $600,000 detention center was recently constructed in Emery County*	Larger, more diverse population including a substantial number of young newcomers--*In both counties a large number of young adults and children--some of these are returning to the area, others coming in from different parts of the country*	Change in the number of arrests on felony/misdemeanor charges--*Since 1974 vandalism has increased 75% and domestic problems 40% in Carbon County* Changes in precautionary efforts by old residents (e.g., locking doors at night) *In Carbon County, traffic violations increased 70% from April-September in 1978*	Increase in crime (Classes 2 & 3)
Mental Health and Well-Being	Number of mental health problems may increase due to stresses from change in jobs and/or environment	Availability of social support systems (assimilation institutions) for newcomers and others with problems (e.g., mental health clinic, newcomers club, other organizational activities)--*The Four Corners Mental Health Clinic is situated in Carbon County (Price); also a Spouse Abuse Program was established in Price*	Relocation of large numbers of people who have various backgrounds Possible breakdowns in other systems (e.g., inadequate recreational activities, overcrowded schools, etc.) Boredom among nonworking wives	Changes in: Divorce rates Marital/family counseling caseload Drug and alcohol related treatments *Preliminary data have shown that caseloads have increased proportionately with population growth; the inpatient unit is now full (it never used*	Mental health facilities and staff overloaded (Classes 2 & 3)

(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Mental Health and Well-Being (cont.)		Stable and homogeneous characteristics of rural communities		*to be); spouse abuse (mostly wife) has increased from 15/yr to about 60/yr in the Price area*	
Cultural and Religious Opportunity	Available leisure/ cultural activities may be insufficient for growing population	Existing entertainment and recreation facilities and cultural opportunities--*Carbon County (especially Price) has a variety of cultural activities for a town of its size, e.g., Art League Community Theatre, Literary League; there are also two movie theatres, swimming pools, tennis courts, etc. In Emery County cultural and recreational activities are much more limited and revolve primarily around the LDS church*	Newcomers may come from larger, more diverse communities with different cultural experience and expectations--*This is especially true for non-Mormon newcomers coming into Emery County*	Increased usage of existing facilities New entertainment and recreational facilities (e.g., restaurants, community center, theaters, parks, etc.)--*A number of new restaurants have opened in Price and a few in Emery County* Increased membership in organizations and special interest clubs (e.g., church social groups, gardening clubs, etc.) Formation of new organizations and/or special interest clubs	Recreational facilities overloaded and choices of activities and recreational events limited (Classes 2 & 3)
		Public and private fiscal capability to provide new entertainment and recreational activities			
		Existing informal mechanisms for leisure activities (e.g., visiting friends and family)			
		Religion an important element in rural society (e.g., as a mechanism for meeting new residents)--*The LDS church is a very important institution--about 50% of Carbon County residents are Mormons; the percent in Emery County is much higher--95% or more; not only are religious activities organized by the LDS church, but also many of the social and cultural activities*	Newcomers seeking to become part of the community--*The LDS church has been very active in helping newcomers, e.g., help them in finding housing, schools, etc.*	Changed number of church sponsored social and youth activities Change in number of formal organized denominations Changes in church membership--*Membership has increased from 3,800 to 4,500 in one stake in the area* Changed economic prosperity for churches	

(continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
CATEGORY: POLITICAL					
Political Participation	Existing political structure may change; old-time political elite may lose control	Existence of stable formal and informal channels for political decision-making (e.g., appointing office holders)--*The coal industry appears to wield the most informal power in the area, the LDS church is also influential, especially in Emery County* Existence of a well defined political system (e.g., a ranching elite)--*Old-timers continue to dominate political offices since most newcomers are not well known; in Carbon there is no effective two party system--the Democratic Party has complete dominance, in Emery party preference is about 50/50*	Large influx of workers with different political attitudes and expectations Introduction of a new constituency including a temporary population (i.e., construction work force) and new permanent residents (i.e., operating work force) Newcomers may be frustrated because they feel they have no stake in the local government (may be only temporary residents)	Possible hegemony of newcomers in political offices or challenging incumbents Possible political conflicts between newcomers and old-timers (e.g., inter-industry and environmental conflicts) Change in political influence of labor unions Percent of new residents registered to vote Continued dominance of elected offices by old-time political elite	Political institutions and actors change (Classes 2 & 3)
Government Responsiveness	Shortfalls in providing public services and facilities during rapid growth	Local government may be unable to respond to rapid population growth because of little experience in dealing with rapid change (e.g., lacking expertise in obtaining federal aid, planning techniques, etc.)--*Both counties have already experienced fluctuations in the coal industry and have learned from this, e.g., Price has continued to upgrade its facilities and is more willing/able to accept growth; Emery County is likely to be less prepared for growth because of its very highly homogeneous population* Existence of formal/informal growth management techniques (e.g., planning, zoning, expansion of water system)	Demand for services increases more rapidly than the tax base necessary to provide them Possible jurisdictional mismatches for local entities--*Although Price (in Carbon County) will be providing a lot of the needed services for the incoming population, it's not likely to receive an adequate share of revenues from energy development* Uncertainty of energy development (start-up and phasing) leading to inability of local government to project revenues and expenditures--*Expansion of the existing mines is uncertain in some cases due to demand factors for coal and federal leasing restrictions*	Changes in per capita expenditures (with slower increase in revenues) Difficulty in accessing bond market Changes in conflicts between old-timers and newcomers (e.g., failure of bond issue votes, letters to editors, political campaigns, emergence of factions within organization) Subjective perceptions of local officials towards new stresses and demands	Local capital and operating expenditures exceed revenues (Classes 1,2&3) Degraded quality of public schools and services (Classes 1,2&3)

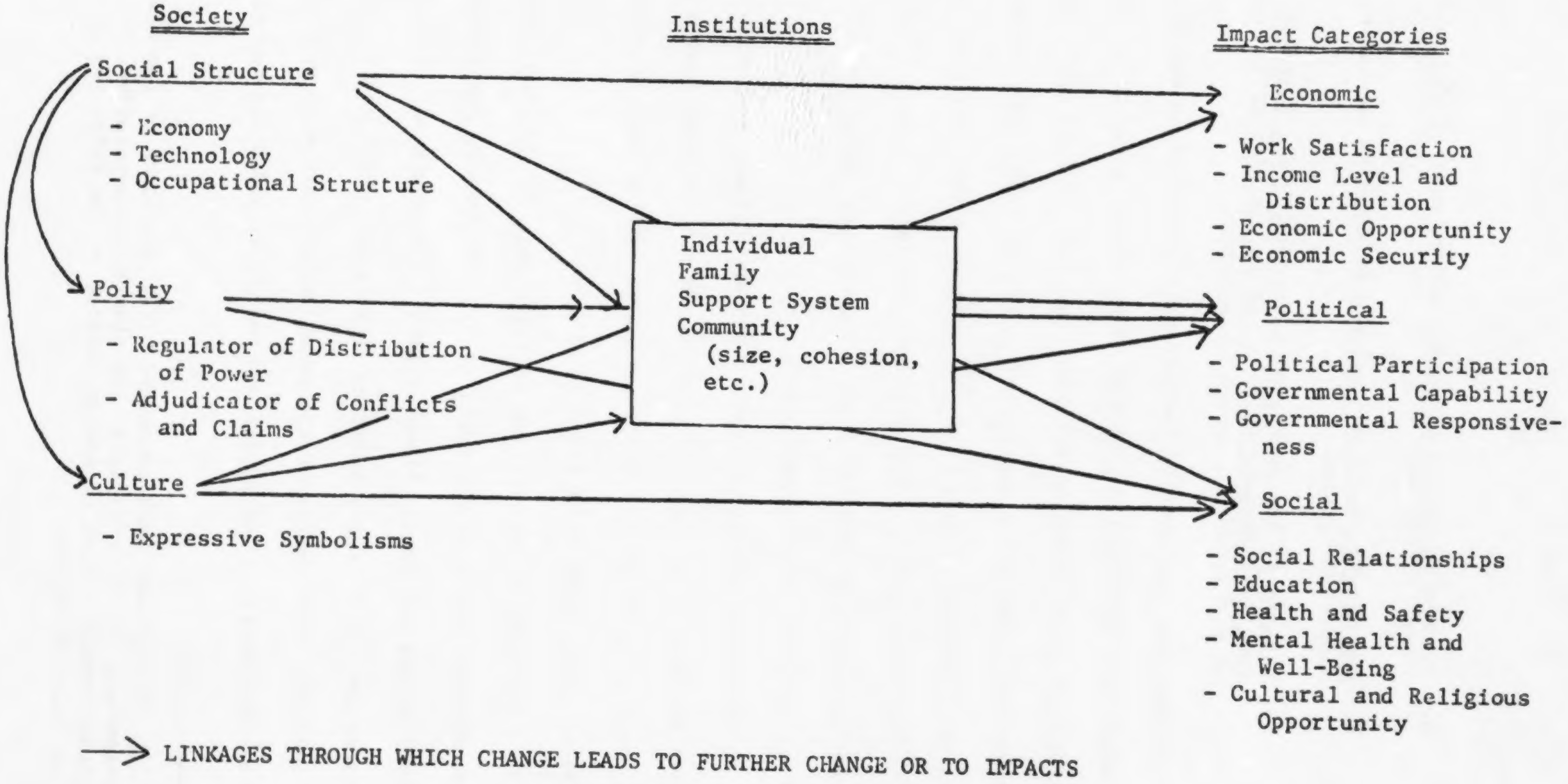
(continued)

EXHIBIT H-1 (Continued)

Impact Categories	Potential Negative/ Positive Impacts	Contributing Factors-- Existing Environment	Contributing Factors-- Energy Developments and/or Related Changes	Indicators of Impacts	Forecast/ Classification
Government Responsiveness (cont.)		Local government may be unwilling to respond to rapid population growth because of existing use of formal/informal growth management techniques (e.g., old-timers may be anti-zoning)--*The scarcity of water in the area has limited where growth can occur; zoning has also been used to control growth*	Magnitude of change from the new energy development Degree of political control by newcomers Degree of intergroup harmony		Governmental processes become formalized (Classes 2 & 3)
	Governmental processes less accessible and less responsive to individuals	Governmental processes informal, long-term individual associations	Professional management becomes greater part of local government	Change in number of professional, government employees Change in governmental expenditures	Governmental processes become formalized (Classes 2 & 3)
CATEGORY: AESTHETICS					
Environment	Physical attractiveness of an area may decline with some physical attributes more vulnerable than others (e.g., a forested area may be more degraded by mining than would be an arid plains area)	Existing physical environment--*The area has some magnificent scenery; dry, open plateau land characterizes the two county area; much is still isolated and undeveloped, Arches, Canyonlands and Capital Reef National Parks are located around the Green River which is within a day's drive* Existence of environmental interest groups--*No environmental groups exist in the two counties; to date environmentalism has not been a dominant force in state politics but this is beginning to change somewhat, the University of Utah and Utah State are the most active in this area*	Type of energy development--*underground coal mining and coal-fired power plant construction* Extensiveness and duration of energy activities--*uncertainty as to demand of western coal* Thoroughness of reclamation project (if any) Changes in land use--*Approximately 92% of land in Emery is owned by the federal or state government; approximately 58% in Carbon County* Introduction of industrial interest groups (e.g., labor unions and management)	Change in level of air, water, and noise pollutants Change in level of litter and abandoned refuse Change in accessibility to scenic or recreational sites Possible conflict between environmental groups and other institutions (e.g., governmental agencies and industry interest groups)	Degraded quality of physical environment (Classes 1,2&3)

END

EXHIBIT H-2. LINKAGES FROM CHANGES IN SOCIAL STRUCTURE TO SOCIAL IMPACTS


Society
Social Structure
- Economy
- Technology
- Occupational Structure
Polity
- Regulator of Distribution of Power
- Adjudicator of Conflicts and Claims
Culture
- Expressive Symbolisms
Institutions
Individual
Family
Support System
Community
(size, cohesion, etc.)
Impact Categories
Economic
- Work Satisfaction
- Income Level and Distribution
- Economic Opportunity
- Economic Security
Political
- Political Participation
- Governmental Capability
- Governmental Responsiveness
Social
- Social Relationships
- Education
- Health and Safety
- Mental Health and Well-Being
- Cultural and Religious Opportunity
→ LINKAGES THROUGH WHICH CHANGE LEADS TO FURTHER CHANGE OR TO IMPACTS

D. Changes in social structure affect most of the potential impact categories.

E. Changes in polity and culture affect most of the potential impact categories.

F. Changes in the status of individuals (see B and C), families, support systems and communities affect most of the potential impact categories.

The linkages and contributing factors were displayed in matrix form and completed with information gathered using three techniques: semi-structured interviews,* participant observation, and both primary and secondary printed sources (e.g., the Price Sun Advocate, Census data, town budgets, and local planning documents). Data from the interviews were analyzed qualitatively and, to a lesser extent, quantitatively to detect trends. The results (shown in italics in Exhibit H-1), are primarily based upon interpretations from site visits to the community.

Choice of impact indicators and appropriate analogies to the Carbon and Emery Counties environment and the proposed energy developments was based on availability of quantitative data as well as on subjective opinion, using input from local interviews.

Finally, in forecasting social change in the study area, the variables that were projected in the model (i.e., employment, population, wage and salary income and public finance) were first analyzed. Variables outside the model (e.g., political structure) which may be direct or indirect consequences of the model output variables were forecast more subjectively. The subjective method included analogy with other boom towns and inference. In interpreting the results of Exhibit H-1, forecasts of contributing factors and impacts are shown in italics. The impact forecasts are made at three levels of confidence: Class 1--based on quantified estimates of change; Class 2--based on analogy with other boom towns; Class 3--possible or inferred, but with little information available.

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*Interviews were conducted with: Director of the Association of Governments, school officials, LDS church representative, Mayor of Price, regional mental health counselor, editor of the Price Sun Advocate, and Price Chief of Police.

Applying the methodology to this case study, data limitations proved to be the greatest constraint. As a consequence, the results are given in more general terms than would be desirable (see Volume II, Section IX: Sociocultural Impacts for further elaboration on the problems of forecasting social impacts).

Results. The magnitude and rate of population growth are major determining factors of social impacts. However, emerging social problems are not simply a function of aggregate size but also of population diversification. For this reason, both Carbon and Emery Counties were chosen for analysis. Carbon County has a more diversified economy (i.e., regional commercial center and some manufacturing) as well as population. In contrast, Emery County's economy is less developed and is more heavily dependent on mining and agriculture. But more importantly, Emery County has a very homogeneous population. As a result, sociocultural impacts are likely to be more profound, assuming that the incoming population is from different backgrounds and cultures than those of the existing population. Consequences such as conflicts between newcomers and old-timers, increased mental health problems, etc., are likely to be very different for Carbon County than for Emery County.

Potential impacts in the four major categories (economic, social, political and aesthetic) are discussed in more detail in the remainder of this section.

Economic. Employment is considered the primary driving force for the types and magnitude of social impacts, because it determines size of population, income levels, types of workers, etc. The changes in population and employment from the base year (Year 0) to Year 13 for Carbon and Emery Counties under Scenario II, using primary data, are shown below.

COMPARISON OF POPULATION AND EMPLOYMENT
FOR YEARS 0 AND 13

Results of Scenario II

	Carbon County		Emery County	
Year:	0	13	0	13
Population	20,500	53,509	10,200	18,889
Employment	8,492	21,992	5,592	8,932

These results have several implications. One is that the large increase in employment is likely to create new job opportunities for those existing residents in the communities, including retention of young residents just entering the work force, who might otherwise have left. However, it is also possible that the higher paying jobs in the energy industry (i.e., mining and construction) may require skills that the local residents do not have; consequently, those jobs may primarily be taken by new residents.

Under Scenario II (primary case study) the shift in the occupational structure, especially in Emery County, is substantial. Along with the predominance of mining and construction activities, trade and other services increase substantially (an 84 percent and 76 percent increase, respectively from Year 0 to Year 13) while agriculture lessens in relative importance (only a 16 percent increase). Carbon County's importance as a regional trade center would increase, including a large gain (219 percent increase over the 13 year period) in the manufacturing sector. This can be attributed to more suppliers of the energy industry such as equipment manufacturers entering the area.

Per capita income increases as a result of the shift in the occupational structure. Under Scenario II, using primary data, per capita income in Emery and Carbon Counties is projected to be $7,213 in Year 13, compared to $5,457 in Year 1--or a relative increase of 32 percent. This change in income levels could have several major effects.

A higher per capita income would cause an increase in the demand for goods and services in other sectors of the economy. One example is an increase in housing demand (see Section G: Housing of this case study for a more complete discussion). However, due to housing supply constraints (i.e., community infrastructure, land costs, and water shortages) especially in Emery County, demand for single family units is greater than supply. Thus, if a family is dissatisfied with its housing, other social problems could result.*

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*In one Colorado boom town, inadequate housing led to a noticeable increase in family disturbances among those residents who were living in mobile homes.

An increase in demand for other goods and services will create more entrepreneurial opportunities for businesses. In Carbon County, several new locally run businesses (e.g., restaurants) have opened, as have some chain grocery stores and restaurants. It is possible that this increased competition will drive out the smaller, family-run businesses. Emery County has an even greater potential for new business opportunities.

While opportunity exists for aggressive entrepreneurs, the increased economic activity is likely to drive up the cost of living, thereby adversely affecting residents on fixed incomes, such as the elderly or workers in lower paying local service jobs. According to 1977 average annual income data (see Exhibit D-3: Population and Income), large wage differentials already exist. For example, in Emery County the average annual income for service employees was $5,720, compared to an income of $23,037 for construction employees.[69]

Increased energy development activity is likely to affect the economic security of the region. It appears that Carbon County will be better able to maintain a stable economy following energy development since it is already fairly diversified (i.e., it is the regional trade and commercial center). In addition, it may be able to attract and retain new industry (i.e., manufacturing) into the area. In contrast, Emery County is still fairly undeveloped; many developments that are occurring now is linked to the energy industry. Thus, the readjustment period for Emery County is likely to be much more difficult, unless strategies for diversifying the economy are undertaken before energy development activity decreases.

Social. Social impact categories such as interpersonal relationships, mental health and well-being, and cultural opportunities are not direct outputs of the model. They must be deduced from social indicators, analogies and inference, and judgments based on the experience in the case study area and other comparable boom towns.

The impact on social relations (i.e., social roles, degree of informality) is likely to be very different for the communities in Carbon County and Emery County. Carbon County has a very heterogeneous population, and in general, there is no well-defined social order. For example, there are several identifiable ethnic groups--i.e., Greeks and Italians comprise about 10 percent of the total population and Mexican-Americans another 10 percent. Mormons comprise about 50 percent of the population, but this percentage is lower than that of other Utah communities.[70] As a result, newcomers with varied backgrounds are more likely to be accepted by the old-time residents.

In contrast, Emery County has a very ethnocentric, homogeneous population, which has resulted in a well-defined social order. Mormons comprise about 95 percent of the population; consequently, social and leadership roles frequently originate and evolve around the Church of Jesus Christ of the Latter Day Saints (LDS). There exists a great degree of informality among the old-time residents in the small Emery County communities. As a result, integration of newcomers into the community is apt to be very difficult, at least initially. In addition, the present leadership styles and social roles may not be viable once the proportion of newcomers to old-timers increases.

The quality of public education is an important aspect of the social network, especially as it contributes to or detracts from a student's learning and socializing experience. As the energy-related growth in Scenario II (primary case study) occurs, the quality of the programs including the facilities themselves could be maintained or enhanced (see Section F: Public Finance). However, in the short term the Carbon County elementary schools, in particular, are at capacity and teachers must enlarge their classes to handle newcomers. Until the situation is stabilized, more learning, truancy and discipline problems may occur. This has been especially true for children of construction workers, whose families may move frequently in one year. These children often have a difficult time catching up and integrating with the other students.

New facilities are needed in the Emery County schools. But, more importantly, there is a teacher shortage due to competition from the higher paying energy jobs.

Impacts on health and safety are already being felt in the two counties. Emery County maintains a clinic but has no hospital, therefore residents must go to Price or Provo for hospital care. While Carbon County does have a 75-bed hospital,* it is severely limited by a shortage of physicians and nurses. As the population continues to grow, the stress on the existing facilities and personnel is likely to increase, at least in the near future.

Public and personal safety, in the past, has been fostered by informal mechanisms and generally has not been a great concern. In 1976,

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*Hospital Corporation of America (which recently purchased the hospita from the city and county) has plans to build a new expanded facility.

Carbon County had a crime rate of 22/1,000. Since 1974, vandalism has increased 75 percent and domestic problems 40 percent, in Carbon County. In 1976, Emery County had the ninth highest crime rate (36/1,000) in the state.[71] While Emery County has experienced the highest growth rate in District 7 (Carbon, Emery, Grand, and San Juan Counties), there continues to be only a county sheriff's department to handle all calls. Some old-time residents have attributed these increases to the young newcomers who have only limited leisure-time activities available to them. Thus, until more law enforcement becomes available and/or there are more recreational activities, crime rates are likely to keep increasing.

Mental health problems are also a result of stresses from change in the environment and/or jobs. A mental health clinic has been established in Price to help residents with their present or potential problems. Spouse abuse has increased so rapidly (from about 15/year to about 60/year in the Price area) that a Spouse Abuse Program was established in Price. In Emery County, the difficulty newcomers face in integrating into the community and the lack of recreation/community programs are likely to make mental health problems a growing concern.

The incoming residents who are members of the LDS church are likely to find integration into the community much easier than nonmembers especially in Emery County. For example, one LDS member said that the church has assisted newcomers in finding housing, schools, etc., as well as welcoming them into the church's social programs.

Carbon County (especially Price) has a relatively large number of cultural/recreational activities, including movies, a community theatre, tennis, swimming, and various social organizations. While new facilities and programs will be needed as growth continues, some alternatives exist now for the residents of Carbon County.

Political. As can be expected, the LDS church is an informal source of political influence especially in Emery County. The coal industry also wields some political influence in both Carbon and Emery Counties. However, as the energy industry expands, it can be expected that its influence as an informal channel for political decision-making would continue to strengthen and perhaps dilute the influence of the LDS church.

The formal decision-making process (i.e., via political parties) is also likely to change. In Carbon County there is virtually no two-party system. The Democratic Party has complete dominance and has been successful in electing favorite sons. It is likely that a large influx of workers could have different political preferences and expectations. As a result, the old-time political elite may be replaced by individuals with different objectives and interests (e.g., more energy industry views). Political party preference is about 50/50 in Emery County. However, nonmembers of the LDS church may become a more dominant force.

In general, issues such as land use, water allocation, and the use of public revenues, are likely to become more important issues in future elections for public office. Local government especially in Emery County may need to obtain more professionals with expertise in general planning technique (e.g., writing federal grant proposals, zoning, etc.). Carbon County, especially Price has become increasingly adept in using planning tools to upgrade its facilities to meet projected needs. As a result, Carbon County is presently better able to accommodate growth in an orderly fashion than Emery County. However, in the long-term, jurisdictional mismatches and uncertainty of new energy projects, may impair the ability to manage growth.

Aesthetics. Approximately 92 percent of the land in Emery County is owned by the state or the federal government as is approximately 58 percent of Carbon County.[72] Much of this land, especially in Emery County is completely undeveloped, and in general, many of the residents are happy to see it put to more productive use. To date, environmentalism has not been a very dominant force in the local area. Thus, it is possible that conflicts between locals and outside environmental groups may begin to emerge over issues of the physical environment. Potential adverse effects on three national parks, all within a day's drive, may be a specific concern of the environmentalists.

Implications. The issues discussed here are given as partial examples of what kinds of change may take place and what the likely consequences may be. Generally, the problems can be expected to be greatest during the construction phase of a power plant since those workers will be in the area only temporarily.

It can also be assumed that social impacts will be greater in Emery County due to the very ethnocentric composition of the population. In addition, the community infrastructures are less well developed and therefore the county is less equipped to handle growth. Thus, the policy implications for Emery County are considerable if the growth would take place as projected.

It is first essential that the local decision-makers be aware of the potential consequences and then anticipate and plan for measures to mitigate the social impacts. Building up the community infrastructure (including recreation facilities) is an essential step, but just as important is the ability to accept and take advantage of the positive aspects of a culturally diverse group.

Carbon County has had a long tradition with growth and change, including the diverse types of people that it brings. However, it is still important to anticipate the broad spectrum of problems that could occur and to be able to respond to them if and when they surface.

LIST OF INTERVIEWEES--SECTION H

Walter T. Axelgard, Mayor, City of Price
Linda Borrell, Carbon County Housing Authority
James Jensen, Principal, Price Elementary School and LDS Church Official
Dennis Nelson, Superintendent, Carbon County School District
Arthur Poloni, Chief of Police, Price
Joe Relando, Editor, Price Sun Advocate
Gary Tomsic, Director, Southeastern Utah Association of Governments
Jim Whear, Director, Four Corners Mental Health Clinic

I. Identifying and Analyzing Other Impacts

Volume II, Section X: Identifying and Analyzing Other Impacts, defines the concepts of nonrecurring and systemic impacts. These two additional classes of impacts were examined for the southeastern Utah case study.

One procedure useful in identifying all impacts, including nonrecurring and sytemic, is to make a detailed list of parties-at-interest to the energy resource development. Exhibit I-1 identifies parties-at-interest for the southeastern Utah coal industry.

Three categories of additional impacts were identified--one related to the uniqueness of the local culture and the others concerning the planning process. The impacts are potentially negative. First, as discussed earlier in Section H: Sociocultural Impacts, Emery County is a very ethnocentric, homogenous community. There have been in the past, and there will continue to be problems for newcomers wishing to integrate into the existing social structure because of the close-knit Emery County society.

Second, there is the lack of an early warning system to alert local officials to the potential impacts of new energy developments. At present there is no industrial association or other formal (or informal) mechanisms for industry to use to discuss and coordinate their plans--either with each other or with the communities involved. This is a concern of the Director of the Local Association of Governments. He would like to improve the leverage of the local governments in order to obtain some concessions from the coal industry.[73]

EXHIBIT I-1. PARTIES-AT-INTEREST TO SOUTHEASTERN UTAH COAL DEVELOPMENT

I. Parties Internal to the Industry

1. Owners and investors+-
2. Employees, as union or nonunion+-
3. Management+-
4. Previously unemployed or underemployed Utah residents, now employed+
5. Previously unemployed or underemployed out-of-state job seekers, now employed+
6. Employees dissatisfied with quality of life- (job, housing, etc.)
7. Company employees who don't wish to relocate-
8. Industry overcharged for community development costs-
9. Employees at time of depletion or abandonment-

II. Suppliers and Customers of the Industry

10. Power plants or other downstream users in southeastern Utah+-
11. Same, in rest of Utah+- (same as above)
12. Same, outside of Utah+ (markets are established enough not to be threatened by new ventures in Utah)
13. Final users of fuel+
14. Local contractors, either profiting from coal development or losing potential jobs because of inability to compete with outside contractors+-
15. Contractor's employees, previously unemployed or underemployed, now employed+
16. Equipment suppliers+
17. Material suppliers, including electricity+

EXHIBIT I-1 (Continued)

18. Residents and community facilities competing for electricity, ending up with less-

19. Unions+

20. Lenders to successful or unsuccessful ventures+-

21. Firms either supplying new technology or innovations+

22. Firms using any "secondary" knowledge gained from technology used in coal development+

23. Final electrical users in another state (e.g., California) not having to bear costs of impacts+

24. Employees dissatisfied with quality of life-

25. Contractors facing nonrecoverable overruns from boom town upsets or from plant/mine shutdown-

26. Displaced employees at time of mine depletion-

27. Railroads and truckers benefiting by increased business+

III. Competitors of the Industry

28. Producers of other fuels and other sources of hydrocarbon, including existing mines, suffering from employment competition-

29. Competitors in synthetic fuel industries seeking employees, customers, or funds for impact mitigation+-

30. Nonunion operations in the region- (assuming unionization of new production)

IV. Government in Different Levels and Roles

31. Federal government seeking domestic energy development+-

32. Federal government with increased taxes and royalties, but little increase in demand for services+

33. State and local government (community, school and county) if and when increased revenues exceed increased costs+

34. Local government enjoying windfall from jurisdictional mismatch+

35. State and local government if given more power by federal legislation+

EXHIBIT I-1 (Continued)

36. Areas developed, which should become more important relative to other state areas and possibly state to other state's lobbyists+

37. Local government (community, school, and county) faced with increased costs and complexity and population fluctuations-

38. State and local government until increased revenues exceed increased costs- (level of services degraded)

39. Local government entities suffering from jurisdictional mismatches-

40. Local government benefiting from increased sales tax revenues due to higher per capita income levels+

41. State and local government if authority or financing or technical assistance is not available-

42. Local citizens (including in-migrating), local government, and mining company suffering from uncertainty if company operations are delayed or stopped by state or federal regulatory agency action/conflict-

43. Local citizens (including in-migrating) government and mining company, if state of federal government prolongs uncertainty by postponing energy policy-

V. Affected Bystanders

44. Residents whose tax rates eventually are lowered+

45. Residents of communities suffering from jurisdictional mismatches-

46. Real estate speculators+

47. Local banking institutions inadequately served by government loan programs and who lack the capital or expertise to make profit in commercial or residential lending endeavors-

48. Mobile home dealers and landlords profiting from the development, or suffering because of financing and zoning problems interfering with development plans+-

49. Successful providers of goods and services+

50. Owners of rental housing+

51. Newcomers who neither can afford nor desire the type of housing available in local communities-

EXHIBIT I-1 (Continued)

52. Real estate developers facing financing problems or large-scale vacancies in finished units-

53. Real estate developers making substantial profits from the inflated prices of new units+

54. Unsuccessful businesses (including ranches) facing higher costs and greater competition-

55. Mobile home dealers and landlords suffering because of financing shortfalls and strict local zoning and planning-

56. Local banking institutions able to capitalize off the commercial or residential building boom+

57. Residents who enjoy the benefits of a community which profits from the windfalls caused by jurisdictional mismatch+

58. Residents facing higher taxes and living costs, without incremental income-

59. Recreational developers+-

60. Residents facing reduced quality of life, including senior citizens, persons on fixed income, and children-

61. Residents resentful of industrialization or urbanization, including residents who reject role changes that they may be forced to make-

62. Residents whose services are cut by inadequate local or state government finance-

63. Water users facing increased costs or reduced supplies or quality of water, e.g., ranchers, recreationalists-

64. Second homeowners, recreationalists and tourists-

65. Environmental activists and organizations+-

66. In-migrating workers who are dissatisfied with quality of life and services, cost of living-

67. Nonunion employers in the region affected by unionization+-

68. Investors in housing and facilities who face extreme uncertainty+-

69. Users of high quality air (residents) affected by decreased air quality-

70. Residents of area affected by transportation impacts-

EXHIBIT I-1 (Continued)

71. Residents of closely knit homogenous communities, such as the prediminately Morman towns in Emery County, who have their way of life disrupted by in-migration of large numbers of outsiders with different ethic backgrounds and social customs-

72. Newcomers moving into closely knit homogenous communities, such as the predominantly Morman towns in Emery County, who are not easily assimulated into the existing social structure-

73. Retailers benefiting from higher per capita income levels.+

Third, the possibility of urban sprawl exists in the study region, particularly in Emery County. While it is the desire of Emery County officials to limit growth outside the communities by stricter adherence to the master plan, many of the towns do not have adequate tools to control their own growth. For example, three, including Huntington, do not have subdivision ordinances and only a few have an approved master plan.[74] Unless the communities equip themselves to handle the growth forecast for the region, there could be serious problems.*

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*Natural constraints to growth do exist and in some instances are considerable, i.e., water (see Section G: Housing).

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